PUBLICATIONS

OF THE

Astronomical Society of America

VOL. II. PART 2

Report of the Comet Committee
Halley's Comet, 1909-1910

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E. E. Barnard
E. B. Frost
E. C. Pickering

PUBLISHED BY THE SOCIETY
1915

American Astronomical Society

Report of Comet Committee 1909-1913

With Index Catalogue of all Photographs of Halley's Comet Reported to the Committee

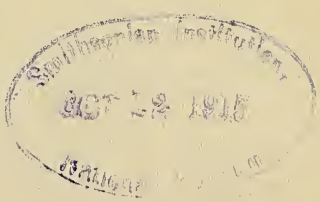
By George C. Comstock, Chairman
E. E. Barnard
E. B. Frost
E. C. Pickering

Photographs of Halley's Comet

Taken at Diamond Head, Hawaiian Islands
By Ferdinand Ellerman

Notes on These Photographs

By E. E. Barnard



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THE ANN ARBOR PRESS, PRINTERS
ANN ARBOR, MICHIGAN

PLATE I

Diamond Head near Honolulu. Arrows point to Ellerman's Observing Station.

INTRODUCTION

With reference to the impending return of Halley's Comet the Astronomical and Astrophysical Society of America in August, 1908, appointed a Comet Committee consisting of E. E. Barnard, C. D. Perrine, E. C. Pickering, and G. C. Comstock, Chairman, with instructions to consider what could be done by the Society to utilize the opportunity about to be offered for adding to our knowledge of comets. Professor Perrine early resigned from the Committee on account of his removal to South America and his place was filled by the appointment of Professor E. B. Frost.

This Committee in November, 1909, issued a circular letter of suggestion for the observation of the comet, from which the following passage is quoted:

"The close approach of the comet to the earth promises unusual opportunity for a study of the physical conditions that obtain in such a body and, as an indispensable basis for such study, the Committee recommends a photographic campaign for the production of a permanent record of the comet's appearance, as long and as nearly continuous as possible. The comet's close proximity to the sun's direction at the time of maximum brilliance imposes serious limitations upon this programme and widely extended coöperation will be required throughout the whole circuit of the earth if this ideal of a continuous photographic record is to be even remotely realized.

"About one-third of the earth's circumference in longitude is covered by the Pacific Ocean, within which there is known to exist no observatory with proper facilities for celestial photography. To fill this gap, at least partially, the Committee, aided by a grant from the National Academy of Sciences, plans to send to the Hawaiian Islands an expedition to photograph the comet during the period of its greatest brilliancy."

The major efforts of the Committee were directed to the photographic campaign thus suggested and in pursuance of the programme above announced, Mr. Ferdinand Ellerman of the Mount Wilson Solar Observatory, was sent to Honolulu in April, 1910, with instructions to occupy the most advantageous site that could be found for photographing Halley's Comet. The Committee extends its cordial thanks to the National Academy of Sciences for the grant which made the expedition possible; to the Mount Wilson Solar Observatory of the Carnegie Institution for giving Mr. Eller-

man's valuable time and experience; to the Lick Observatory for loaning the 6-inch equatorial mounting; to the John A. Brashear Company of Pittsburg for the loan of the 6-inch camera; to the Bausch & Lomb Company of Rochester, New York, for the loan of the Tessar lens; and in minor measure to other institutions and persons.

The Committee is especially indebted to Mr. Ellerman for the zealous discharge of the duties entrusted to him. Details of local conditions affecting his work at Diamond Head are contained in the following memorandum prepared by him. The Committee has also to extend its thanks to citizens of Honolulu for advice and assistance freely extended to Mr. Ellerman.

A further purpose of the Committee is set forth in the following circular letter which was widely distributed and to which replies have been received from many observatories:

Madison, Wis., December 20, 1910.

DEAR SIR:

The Committee above named purposes to prepare a photographic history of the appearances presented by Halley's Comet during the years 1909-10, and desires to incorporate in that history all of the best photographs available, together with so many of those of inferior excellence as may be necessary to secure continuity of the record. As a guide in the collection of material it provisionally adopts the following classification of negatives obtained by observers skilled in astronomical photography:

A. Photographs of conspicuous technical excellence.
B. Photographs of grade intermediate between A and C.
C. Photographs, presenting obvious technical defects, *e.g.*, fog, bad guiding, under exposure, etc.

To the above may be added:

D. Photographs obtained with small cameras by unskilled observers.

The Committee solicits from every astronomer who possesses material of the kind above indicated a description of each negative deemed suitable for its purposes. This description should include the place of observation, latitude and longitude reckoned from Greenwich, aperture and focal length of the objective employed, the kind of plate used and the Greenwich mean solar times of beginning and end of the exposure, together with such special remarks as the observer may deem of importance. A form upon which to enter such description has been prepared by the Committee and accompanies this letter, or will be sent to any astronomer upon request made to the undersigned.

From the material thus brought to its knowledge the Committee will select such items as seem best adapted to its purpose and will request that contact prints upon glass be prepared from the several negatives and transmitted to it, either in exchange for similar prints made from its own negatives

exposed in the Hawaiian Islands, or with the understanding that the Committee will defray the necessary cost of preparing and transmitting the positives requested by it.

In order that the work thus outlined may progress as rapidly as possible, it is requested that a description of the material available for the purposes of the Committee may be forwarded with all convenient despatch to the Chairman.

GEORGE C. COMSTOCK,
Washburn Observatory,
Madison, Wis., U. S. A.

Subsequent developments have made it seem inexpedient to carry out the program above outlined. The photographs obtained at the Lick Observatory and at Cordoba are so numerous and excellent that they must have constituted a large part of the material reproduced and, since these observatories have indicated a purpose to reproduce their own photographs and a similar policy seems to be contemplated elsewhere, the Committee deems it unwise to undertake a duplicate publication, and equally unwise to make one from which this material is omitted. Therefore it limits its programme to the reproduction in this volume of the more important of the Ellerman photographs obtained under its own auspices, to notes upon them, and to the publication of an index-catalogue of photographs of Halley's Comet constructed from the replies received to its circular letter above given.

This index-catalogue unfortunately is not complete, since there is known to be missing from it the work of one observatory from which the desired information has been requested in vain, and, in a number of instances, the data furnished from other observatories are expressly stated to be selected from a larger body of material. For the most part it may be assumed that the material thus purposely excluded is of minor value for a study of the appearances presented by the comet although, as stated in some cases, it may be of service in determining positions of the comet. Another important omission is that of photographic spectra, which are not here included since data regarding them have been received from only two or three observatories. Subject to the above limitations, there is included in the following catalogue a list of all plates reported to the Committee that are classified by their makers as of grade A, B, or C, with exception of a very few which although called of class C are especially designated as "of no scientific value" or by other equivalent phrase.

The form given the catalogue seems to call for little explanation: In column 2 the Greenwich Mean Time of mid-exposure is reckoned

from noon, the exposure time in column 3 is expressed in mean solar minutes; the quality symbol in column 4 is defined in the circular letter given above. This datum, however, must not be too much emphasized since the estimates of quality made by many persons, under widely varying circumstances and with diverse standards of excellence are subject to a considerable margin of uncertainty. The number given under the heading *f/a* in column 5 is the ratio of focal length to aperture in the telescope employed and the focal length itself is given, in centimeters, in column 6. The last column contains a statement of the place at which the photograph was secured. Usually the place is designated by the geographical term employed in the American Ephemeris for the observatory in question, but a few exceptions to this rule have been made, *e. g.*, the Radcliffe, Harvard, Yerkes, and Lick Observatories will be understood to refer to Oxford, Cambridge, Williams Bay, and Mt. Hamilton respectively. For the Vatican observatory see Rome. The latitude and longitude of those stations not given in the table of Observatories contained in the American Ephemeris for the year 1915, may be taken from the following table in which longitudes are reckoned west from Greenwich:

Supplementary List of Observatories.

Station.	Latitude.	Longitude.
Beirut	+33° 54′	324° 32′
Cambridge	+42 23	71 7
Dairen	+38 55	238 20
Diamond Head	+21 15	157 49
Fosterdown	+51 16	0 4
Helwan	+29 52	328 40
Juvisy	+48 42	357 38
Kodaikanal	+10 14	282 32
Santiago (D. O. Mills)	−33 27	70 38
Simeis	+44 25	326 1
Teneriffe	+28 13	10 21

The following statements will serve to identify some of the entries in the foregoing table.

Beirut. Observatory of the Syrian Protestant College.

Cambridge. Students' Astronomical Laboratory of Harvard University.

Dairen. Dependent upon Tokyo Observatory.

Fosterdown. Dependent upon Solar Physics Observatory, South Kensington.

Santiago. Dependent upon Lick Observatory.

Simeis. Dependent upon Pulkowa.

Teneriffe. Expedition of Jean Mascart.

INDEX-CATALOGUE OF PHOTOGRAPHS OF HALLEY'S COMET

DATE 1909		G. M. T. h	m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
August	24	13	6	104	A	5	350	Helwan
September	12	22	30	60	C	6	535	Lick
	13	12	40	150	B	5	350	Helwan
	13	23	42	70	A	6	535	Lick
	14	23	30	76	B	6	535	Lick
	15	13	2	150	A	5	350	Helwan
	15	21	0	160	B	4	236	Yerkes
	16	20	45	180	A	4	236	Yerkes
	17	20	10	130	A	4	236	Yerkes
	22	23	8	80	B	6	535	Lick
	23	0	8	30	A	6	535	Lick
	24	20	27	150	A	4	236	Yerkes
	25	20	29	87	A	4	236	Yerkes
	26	21	17	60	B	4	236	Yerkes
October	8	18	57	64	C	4	236	Yerkes
	9	1	6	20	B	6	535	Lick
	9	23	5	50	B	6	535	Lick
	10	22	10	15	B	6	535	Lick
	10	23	5	34	A	6	535	Lick
	12	21	50	36	C	6	535	Lick
	12	22	27	25	A	6	535	Lick
	13	18	50	60	B	4	236	Yerkes
	13	19	50	40	B	4	236	Yerkes
	14	0	1	31	B	6	535	Lick
	14	0	32	20	A	6	535	Lick
	14	0	47	5	A	6	535	Lick
	14	20	50	60	B	4	236	Yerkes
	14	23	32	20	A	6	535	Lick
	15	0	15	34	A	6	535	Lick

DATE 1909		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
October	15	20 2	30	C	4	236	Yerkes
	16	21 10	30	A	4	236	Yerkes
	18	19 10	50	A	4	236	Yerkes
	19	12 37	40	A	4	236	Yerkes
	21	20 11	20	B	6	535	Lick
	22	20 46	20	A	6	535	Lick
	25	22 2	20	A	4	236	Yerkes
	26	22 35	15	A	4	236	Yerkes
	26	22 52	15	B	4	236	Yerkes
November	14	18 50	10	A	6	535	Lick
	14	19 3	10	B	6	535	Lick
	14	20 16	60	C	6	535	Lick
	15	18 54	8	A	6	535	Lick
	15	19 3	5	B	6	535	Lick
	15	20 21	130	C	6	535	Lick
	15	23 31	104	C	6	535	Lick
	17	19 57	62	C	6	535	Lick
	22	12 30	120	B	11	686	Radcliffe
December	4	2 38	85	B	17	690	Zô Sè
	4	2 38	85	B	4	60	Zô Sè
	5	2 11	81	B	17	690	Zô Sè
	5	2 11	81	B	4	60	Zô Sè
	9	14 21	132	A	5	128	Yerkes
	9	14 21	132	B	5	78	Yerkes
	13	16 37	20	B	6	535	Lick
	13	17 59	30	A	6	535	Lick
	13	19 5	35	A	6	535	Lick
	14	9 56	66	A	4	56	Juvisy
	14	18 27	120	A	6	535	Lick
	15	13 23	14	B	5	128	Yerkes
	15	17 47	90	C	6	535	Lick
	16	17 49	110	C	6	535	Lick
	20	1 49	60	B	17	690	Zô Sè
	20	1 49	60	B	4	60	Zô Sè
	29	12 32	33	B	5	51	Ann Arbor
	29	12 47	95	A	5	128	Yerkes
	29	12 47	95	A	5	78	Yerkes
	30	8 15	60	B	6	130	Geneva
1910							
January	3	11 40	70	A	6	84	Madrid
	3	13 49	197	A	5	128	Yerkes
	3	13 49	197	A	5	78	Yerkes
	6	13 29	103	A	5	128	Yerkes
	6	13 29	103	A	5	78	Yerkes
	6	15 38	105	B	5	63	Des Moines

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
January	7	10 40	75	A	4	56	Juvisy
	7	16 36	50	C	6	535	Lick
	7	17 48	49	A	6	535	Lick
	9	11 8	75	A	6	84	Madrid
	9	13 5	100	A	5	128	Yerkes
	9	13 5	100	A	5	78	Yerkes
	9	15 48	90	B	5	51	Ann Arbor
	13	6 39	60	B	6	130	Geneva
	14	14 58	146	A	5	128	Yerkes
	14	14 58	146	B	5	78	Yerkes
	16	7 10	60	C	6	130	Geneva
	28	16 27	54	B	5	78	Lick
	29	16 35	70	B	5	78	Lick
	30	8 30	132	A	4	56	Juvisy
	30	14 40	60	C	5	63	Des Moines
	30	17 2	96	C	5	78	Lick
February	1	14 13	30	C	4	236	Yerkes
	1	16 33	62	B	5	78	Lick
	2	14 7	12	B	6	84	Madrid
	2	16 29	62	C	6	535	Lick
	2	16 29	62	C	5	66	Lick
	3	14 7	77	A	5	128	Yerkes
	3	14 7	77	A	5	78	Yerkes
	4	16 33	110	A	6	535	Lick
	4	16 33	110	A	5	66	Lick
	5	7 18	60	B	6	130	Geneva
	5	16 32	90	A	6	535	Lick
	5	16 32	90	A	5	66	Lick
	7	13 5	60	B	5	51	Ann Arbor
	9	8 13	120	A	4	56	Juvisy
	10	5 3	30	A	5	350	Helwan
	10	12 32	100	B	5	106	Ottawa
	10	13 40	110	A	5	128	Yerkes
	10	13 40	110	A	5	78	Yerkes
	10	13 40	110	A	5	47	Yerkes
	10	16 27	122	A	6	535	Lick
	10	16 27	122	A	5	66	Lick
	10	16 36	142	A	6	83	Lick
	11	15 57	76	A	6	535	Lick
	11	15 57	76	A	5	66	Lick
	11	16 1	66	C	6	83	Lick
	12	7 50	81	A	4	56	Juvisy
	13	7 40	40	B	6	84	Madrid
	14	7 37	46	B	6	84	Madrid
	16	6 52	60	B	6	130	Geneva

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	*f/a*	*f* cm	PLACE
February	20	6 46	17	B	6	130	Geneva
	27	13 25	60	A	5	128	Yerkes
	27	13 25	60	A	5	78	Yerkes
	28	5 28	20	A	5	350	Helwan
	28	15 36	65	B	6	535	Lick
	28	15 36	65	C	5	66	Lick
March	1	7 35	30	A	6	84	Madrid
	1	15 37	43	A	5	66	Lick
	1	15 37	43	B	6	535	Lick
	2	7 32	35	B	6	84	Madrid
	3	7 3	22	B	6	130	Geneva
	3	15 14	17	C	5	66	Lick
	3	15 14	17	C	6	535	Lick
	4	5 10	25	A	5	350	Helwan
	5	6 48	14	C	6	130	Geneva
	5	15 29	43	B	5	66	Lick
	5	15 29	43	C	6	535	Lick
	6	13 17	43	C	5	128	Yerkes
	6	13 17	43	B	5	78	Yerkes
	7	15 31	34	B	6	535	Lick
	8	15 28	40	C	6	535	Lick
	8	15 28	40	C	5	78	Lick
	9	15 30	33	B	6	535	Lick
	9	15 30	33	B	5	78	Lick
	10	15 24	27	C	6	535	Lick
	11	15 25	17	C	6	535	Lick
April	12	0 47	3	C	6	535	Lick
	13	0 23	14	C	6	535	Lick
	14	3 14	6	C	5	81	Diamond Hd.
	14	15 54	25	B	8	27	Cape
	14	15 55	16	..	10	330	Cape
	15	0 21	11	A	6	535	Lick
	15	0 21	11	A	5	78	Lick
	15	0 21	11	A	5	66	Lick
	15	3 16	5	B	5	81	Diamond Hd.
	15	15 53	30	B	8	27	Cape
	15	17 23	10	C	11	250	Teneriffe
	16	0 16	24	B	6	535	Lick
	16	0 16	24	B	5	78	Lick
	16	0 16	24	B	5	66	Lick
	16	9 23	30	B	10	343	Perth
	16	14 26	5	A	5	350	Helwan
	16	17 32	15	C	11	250	Teneriffe
	16	21 56	14	C	5	128	Yerkes
	16	21 56	14	C	5	78	Yerkes

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
April	17	0 14	27	A	6	535	Lick
	17	0 14	27	A	5	78	Lick
	17	0 14	27	B	5	66	Lick
	17	9 18	35	B	10	343	Perth
	17	15 47	43	B	8	27	Cape
	17	17 19	15	C	8	30	Teneriffe
	17	17 27	30	C	11	250	Teneriffe
	17	21 42	5	A	5	68	Cordoba
	18	0 9	28	A	6	535	Lick
	18	0 9	28	A	5	78	Lick
	18	0 9	28	B	5	66	Lick
	18	11 43	16	C	7	86	Kodaikanal
	18	14 11	6	A	5	350	Helwan
	18	17 11	15	C	8	30	Teneriffe
	18	17 22	37	C	11	250	Teneriffe
	18	21 20	35	A	5	68	Cordoba
	19	0 0	2	C	6	535	Lick
	19	0 23	6	B	6	535	Lick
	19	0 32	6	B	6	535	Lick
	19	11 30	30	A	7	86	Kodaikanal
	19	14 8	10	A	5	350	Helwan
	19	15 15	9	B	10	344	Catania
	19	15 15	9	B	4	44	Catania
	19	15 47	40	..	10	330	Cape
	19	15 48	52	B	8	27	Cape
	19	17 10	20	C	8	30	Teneriffe
	19	17 20	40	C	11	250	Teneriffe
	19	21 10	27	A	5	68	Cordoba
	19	21 30	30	A	10	343	Cordoba
	19	21 44	22	C	5	78	Yerkes
	20	0 3	35	A	6	535	Lick
	20	0 3	35	A	5	78	Lick
	20	0 3	35	A	5	66	Lick
	20	0 26	5	A	6	535	Lick
	20	11 27	28	A	7	86	Kodaikanal
	20	11 35	24	B	8	188	Kodaikanal
	20	15 14	15	B	10	344	Catania
	20	15 14	15	B	4	44	Catania
	20	20 52	15	C	7	113	Cambridge
	20	21 53	17	C	5	128	Yerkes
	20	21 53	17	C	5	78	Yerkes
	20	22 22	15	C	5	63	Des Moines
	21	0 7	30	B	5	78	Lick
	21	0 7	30	C	5	66	Lick
	21	11 22	43	A	7	86	Kodaikanal

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
April	21	11 30	33	A	8	188	Kodaikanal
	21	14 3	20	C	5	350	Helwan
	21	15 4	45	B	4	113	Johannesburg
	21	15 10	19	C	4	44	Catania
	21	15 15	30	C	10	344	Catania
	21	15 42	68	B	8	27	Cape
	21	15 44	50	..	10	330	Cape
	21	17 8	35	C	8	30	Teneriffe
	21	17 13	10	C	8	30	Teneriffe
	21	17 13	45	C	11	250	Teneriffe
	21	21 43	30	A	6	115	Arequipa
	21	21 46	40	A	5	78	Santiago
	21	22 18	16	C	5	78	Santiago
	22	0 2	33	B	6	535	Lick
	22	0 2	33	B	5	78	Lick
	22	0 2	33	A	5	66	Lick
	22	0 25	6	A	6	535	Lick
	22	11 25	40	A	7	86	Kodaikanal
	22	11 28	38	A	8	188	Kodaikanal
	22	13 38	5	C	5	60	Simeis
	22	14 4	12	C	5	350	Helwan
	22	15 22	5	B	10	344	Catania
	22	15 43	80	C	6	27	Cape
	22	15 43	60	C	10	330	Cape
	22	23 58	36	B	5	78	Lick
	22	23 58	36	B	6	535	Lick
	23	0 22	6	B	6	535	Lick
	23	14 2	5	C	5	350	Helwan
	23	15 39	17	B	6	130	Geneva
	23	22 0	40	C	5	78	Santiago
	23	23 51	23	C	6	535	Lick
	23	23 59	37	C	5	78	Lick
	24	0 11	13	B	6	535	Lick
	24	11 8	19	B	7	86	Kodaikanal
	24	11 28	19	B	7	86	Kodaikanal
	24	11 38	15	B	8	188	Kodaikanal
	24	15 1	23	B	10	344	Catania
	24	16 2	24	B	6	84	Madrid
	24	17 9	10	C	8	30	Teneriffe
	24	17 14	20	C	11	250	Teneriffe
	24	21 20	15	A	10	343	Cordoba
	25	0 0	27	B	6	535	Lick
	25	0 19	10	A	6	535	Lick
	25	3 18	5	C	5	81	Diamond Hd.
	25	9 40	27	C	10	343	Perth

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
April	25	11 23	22	A	7	86	Kodaikanal
	25	11 26	31	B	8	29	Kodaikanal
	25	11 30	20	B	8	188	Kodaikanal
	25	14 59	27	C	10	344	Catania
	25	17 15	15	C	11	250	Teneriffe
	25	17 20	5	C	8	30	Teneriffe
	25	21 1	15	A	10	343	Cordoba
	25	21 20	15	A	10	343	Cordoba
	25	21 38	5	A	10	343	Cordoba
	26	2 52	35	B	5	81	Diamond Hd.
	26	3 18	7	C	5	81	Diamond Hd.
	26	9 32	32	C	6	45	Perth
	26	9 32	32	C	10	343	Perth
	26	11 25	30	B	7	86	Kodaikanal
	26	11 28	27	B	8	29	Kodaikanal
	26	11 32	15	C	8	188	Kodaikanal
	26	14 16	3	B	5	350	Helwan
	26	15 1	24	B	10	344	Catania
	26	15 45	17	..	10	330	Cape
	26	16 38	15	C	11	250	Teneriffe
	26	16 58	10	C	11	250	Teneriffe
	26	17 15	15	C	11	250	Teneriffe
	26	20 25	23	B	7	113	Cambridge
	26	20 43	10	C	7	113	Cambridge
	26	21 2	15	A	10	343	Cordoba
	26	21 19	15	A	10	343	Cordoba
	26	21 32	5	A	10	343	Cordoba
	26	21 48	60	B	5	78	Santiago
	27	2 32	20	B	5	81	Diamond Hd.
	27	2 56	25	A	5	81	Diamond Hd.
	27	3 16	12	C	5	81	Diamond Hd.
	27	7 51	16	B	4	14	Dairen
	27	7 51	16	B	3	24	Dairen
	27	7 53	24	B	9	88	Dairen
	27	13 16	25	B	5	60	Simeis
	27	13 38	25	B	5	91	Beirut
	27	14 6	5	B	5	350	Helwan
	27	15 8	21	B	6	130	Geneva
	27	15 25	10	B	24	130	Geneva
	27	16 9	18	B	6	84	Madrid
	27	16 9	18	B	10	200	Madrid
	27	20 24	12	C	7	113	Cambridge
	27	20 55	15	A	10	343	Cordoba
	27	21 14	15	A	10	343	Cordoba
	27	22 12	15	C	5	63	Des Moines

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
April	28	2 56	26	A	5	81	Diamond Hd.
	28	3 16	9	C	5	81	Diamond Hd.
	28	7 46	41	C	9	88	Dairen
	28	7 46	41	C	3	24	Dairen
	28	7 46	41	C	4	14	Dairen
	28	9 13	60	C	10	343	Perth
	28	9 13	60	C	6	45	Perth
	28	11 8	20	A	7	86	Kodaikanal
	28	11 18	36	A	8	188	Kodaikanal
	28	11 18	51	A	8	29	Kodaikanal
	28	11 32	26	A	7	86	Kodaikanal
	28	13 14	24	B	5	91	Beirut
	28	13 55	10	B	5	350	Helwan
	28	17 2	4	C	11	250	Teneriffe
	28	17 2	4	C	8	30	Teneriffe
	28	21 28	7	C	6	94	Washington
	28	21 42	79	B	5	78	Santiago
	28	23 53	30	A	6	535	Lick
	28	23 56	37	A	5	78	Lick
	29	0 14	10	B	6	535	Lick
	29	2 34	18	A	5	81	Diamond Hd.
	29	2 55	21	B	5	81	Diamond Hd.
	29	3 11	8	B	5	81	Diamond Hd.
	29	6 33	42	B	3	8	Tokyo
	29	6 33	42	B	6	120	Tokyo
	29	6 33	42	B	3	25	Tokyo
	29	7 12	55	C	10	343	Perth
	29	7 42	49	C	9	88	Dairen
	29	7 42	49	C	3	24	Dairen
	29	7 42	49	C	4	14	Dairen
	29	11 10	28	A	7	86	Kodaikanal
	29	11 19	32	B	8	188	Kodaikanal
	29	11 34	19	A	7	86	Kodaikanal
	29	13 15	10	A	5	60	Simeis
	29	13 15	30	B	5	91	Beirut
	29	15 0	21	C	6	130	Geneva
	29	15 55	55	B	6	27	Cape
	29	20 54	10	C	4	236	Yerkes
	29	21 13	2	C	5	128	Yerkes
	29	21 27	15	A	5	68	Cordoba
	29	21 27	10	C	5	47	Yerkes
	29	21 33	30	A	6	115	Arequipa
	29	21 35	15	A	10	343	Cordoba
	29	21 41	5	A	5	68	Cordoba
	30	2 48	35	A	5	81	Diamond Hd.

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
April	30	3 12	5	B	5	81	Diamond Hd.
	30	6 33	36	B	3	25	Tokyo
	30	6 33	36	C	3	8	Tokyo
	30	6 33	36	B	6	120	Tokyo
	30	11 0	22	A	7	86	Kodaikanal
	30	11 15	51	A	8	29	Kodaikanal
	30	11 28	29	A	7	86	Kodaikanal
	30	13 43	8	A	5	350	Helwan
	30	14 54	25	B	10	344	Catania
	30	15 3	30	B	4	113	Johannesburg
	30	15 4	7	B	4	44	Catania
	30	15 49	42	B	10	200	Madrid
	30	16 24	15	C	11	250	Teneriffe
	30	17 1	20	C	11	250	Teneriffe
	30	21 12	4	A	5	68	Cordoba
	30	21 28	9	A	5	68	Cordoba
	30	23 36	34	C	6	535	Lick
	30	23 44	50	A	5	78	Lick
	30	23 44	50	A	5	66	Lick
	30	23 44	50	A	3	13	Lick
May	1	0 4	20	A	6	535	Lick
	1	2 42	15	B	5	81	Diamond Hd.
	1	7 29	52	C	3	24	Dairen
	1	7 29	52	C	4	14	Dairen
	1	7 32	57	C	9	88	Dairen
	1	11 4	30	A	7	86	Kodaikanal
	1	11 18	53	A	8	29	Kodaikanal
	1	11 32	21	A	7	86	Kodaikanal
	1	13 28	30	C	5	91	Beirut
	1	14 3	10	A	5	350	Helwan
	1	14 58	22	C	24	130	Geneva
	1	16 51	12	C	8	30	Teneriffe
	1	16 58	19	C	11	250	Teneriffe
	1	21 8	15	A	10	343	Cordoba
	1	21 24	14	C	6	94	Washington
	1	21 37	15	A	5	68	Cordoba
	1	21 39	5	A	10	343	Cordoba
	1	21 53	9	A	10	343	Cordoba
	1	22 4	14	C	5	63	Des Moines
	1	23 23	35	A	6	535	Lick
	1	23 35	60	B	5	78	Lick
	1	23 35	60	B	5	66	Lick
	1	23 35	60	A	3	13	Lick
	1	23 54	23	A	6	535	Lick
	2	0 11	6	B	6	535	Lick

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
May	2	2 34	46	A	5	81	Diamond Hd.
	2	3 2	7	A	5	81	Diamond Hd.
	2	6 18	48	A	6	120	Tokyo
	2	6 18	..	B	3	87	Tokyo
	2	6 18	48	C	3	25	Tokyo
	2	6 18	48	B	3	8	Tokyo
	2	7 48	23	C	3	24	Dairen
	2	7 48	23	C	4	14	Dairen
	2	7 49	26	C	9	88	Dairen
	2	11 4	22	A	7	86	Kodaikanal
	2	11 21	38	A	8	188	Kodaikanal
	2	11 35	10	C	7	86	Kodaikanal
	2	14 0	15	A	5	350	Helwan
	2	14 38	25	B	10	344	Catania
	2	14 41	18	A	4	44	Catania
	2	14 59	21	B	24	130	Geneva
	2	15 32	105	A	6	27	Cape
	2	15 43	30	..	10	330	Cape
	2	15 46	32	A	6	84	Madrid
	2	15 46	32	A	10	20	Madrid
	2	16 20	20	C	8	30	Teneriffe
	2	16 25	30	C	11	250	Teneriffe
	2	17 1	15	C	8	30	Teneriffe
	2	17 11	35	C	11	250	Teneriffe
	2	20 57	30	A	10	343	Cordoba
	2	21 0	15	A	5	68	Cordoba
	2	21 20	15	A	5	68	Cordoba
	2	21 24	5	A	10	343	Cordoba
	2	21 27	36	A	5	78	Santiago
	2	21 37	10	A	10	343	Cordoba
	2	21 47	4	A	10	343	Cordoba
	3	2 12	25	A	5	81	Diamond Hd.
	3	2 39	24	A	5	81	Diamond Hd.
	3	3 1	12	A	5	81	Diamond Hd.
	3	11 4	40	C	7	86	Kodaikanal
	3	11 8	68	C	8	29	Kodaikanal
	3	11 12	55	A	6	20	Kodaikanal
	3	11 32	13	C	7	86	Kodaikanal
	3	14 38	29	B	4	20	Catania
	3	14 38	29	B	4	44	Catania
	3	14 41	34	B	10	344	Catania
	3	15 32	39	A	10	200	Madrid
	3	15 32	39	A	6	84	Madrid
	3	15 44	87	A	6	27	Cape
	3	16 26	35	C	11	250	Teneriffe

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
May	3	16 34	20	C	8	30	Teneriffe
	3	17 3	20	C	8	30	Teneriffe
	3	17 10	35	C	11	250	Teneriffe
	3	20 18	37	C	5	106	Ottawa
	3	20 58	25	A	10	343	Cordoba
	3	21 1	30	A	5	68	Cordoba
	3	21 1	38	A	5	128	Yerkes
	3	21 1	37	A	5	47	Yerkes
	3	21 10	5	B	4	236	Yerkes
	3	21 13	18	B	5	51	Ann Arbor
	3	21 20	5	B	4	236	Yerkes
	3	21 21	6	A	10	343	Cordoba
	3	21 26	10	A	5	68	Cordoba
	3	21 28	5	C	5	51	Ann Arbor
	3	21 28	3	A	4	236	Yerkes
	3	21 32	2	A	4	236	Yerkes
	3	21 32	10	B	5	128	Yerkes
	3	21 32	10	A	5	78	Yerkes
	3	21 41	15	A	10	343	Cordoba
	3	21 48	20	B	5	63	Des Moines
	3	21 54	3	A	10	343	Cordoba
	4	2 42	40	A	5	81	Diamond Hd.
	4	3 12	5	B	5	81	Diamond Hd.
	4	11 20	49	B	8	29	Kodaikanal
	4	11 26	34	A	6	20	Kodaikanal
	4	11 30	24	A	8	188	Kodaikanal
	4	11 30	27	A	7	86	Kodaikanal
	4	14 37	26	B	4	20	Catania
	4	14 39	30	B	10	344	Catania
	4	14 54	30	A	4	113	Johannesburg
	4	15 20	7	A	18	290	Juvisy
	4	15 26	44	A	6	84	Madrid
	4	15 26	44	A	10	200	Madrid
	4	16 19	20	C	8	30	Teneriffe
	4	16 19	20	C	11	250	Teneriffe
	4	16 41	15	C	8	30	Teneriffe
	4	16 59	50	C	11	250	Teneriffe
	4	17 16	15	C	8	30	Teneriffe
	4	20 51	20	A	5	68	Cordoba
	4	20 54	25	C	5	51	Ann Arbor
	4	21 0	40	A	5	128	Yerkes
	4	21 0	40	A	5	78	Yerkes
	4	21 0	40	A	5	47	Yerkes
	4	21 8	25	A	10	343	Cordoba
	4	21 12	5	B	5	51	Ann Arbor

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
May	4	21 24	5	A	4	236	Yerkes
	4	21 25	78	A	5	78	Santiago
	4	21 28	20	A	5	68	Cordoba
	4	21 29	1	A	4	236	Yerkes
	4	21 30	5	A	10	343	Cordoba
	4	21 33	4	A	4	236	Yerkes
	4	21 33	13	A	5	128	Yerkes
	4	21 33	13	A	5	78	Yerkes
	4	21 38	4	A	4	236	Yerkes
	4	21 40	28	B	5	63	Des Moines
	4	21 41	1	A	4	236	Yerkes
	4	21 45	10	A	10	343	Cordoba
	4	21 54	3	A	10	343	Cordoba
	4	23 25	55	A	3	13	Lick
	4	23 25	55	A	5	78	Lick
	4	23 25	55	A	5	66	Lick
	4	23 27	30	A	6	535	Lick
	4	23 41	23	A	6	535	Lick
	5	0 0	10	A	6	535	Lick
	5	2 45	32	A	4	25	Diamond Hd.
	5	2 46	33	A	5	81	Diamond Hd.
	5	3 8	8	B	5	81	Diamond Hd.
	5	7 9	40	B	4	14	Dairen
	5	7 13	48	B	3	24	Dairen
	5	7 15	53	B	9	88	Dairen
	5	11 19	50	B	7	86	Kodaikanal
	5	11 19	50	A	6	20	Kodaikanal
	5	13 10	35	B	5	91	Beirut
	5	13 14	38	B	4	24	Beirut
	5	14 38	29	A	10	344	Catania
	5	14 38	27	B	4	20	Catania
	5	15 1	30	A	4	113	Johannesburg
	5	15 25	46	A	6	84	Madrid
	5	15 25	46	A	10	200	Madrid
	5	16 28	50	C	8	30	Teneriffe
	5	16 41	77	C	11	250	Teneriffe
	5	17 6	13	C	8	30	Teneriffe
	5	19 58	26	A	4	16	Cambridge
	5	20 0	30	A	8	34	Harvard
	5	20 1	26	A	7	113	Cambridge
	5	20 6	36	C	5	106	Ottawa
	5	20 16	5	A	7	113	Cambridge
	5	20 19	16	A	14	392	Harvard
	5	20 22	10	A	8	34	Harvard
	5	20 45	20	A	5	68	Cordoba

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
May	5	20 52	25	C	5	51	Ann Arbor
	5	20 57	25	A	10	343	Cordoba
	5	21 11	8	C	5	51	Ann Arbor
	5	21 16	15	B	6	94	Washington
	5	21 18	35	A	5	68	Cordoba
	5	21 20	5	A	10	343	Cordoba
	5	21 33	30	B	5	63	Des Moines
	5	21 33	10	A	10	343	Cordoba
	5	21 45	3	A	10	343	Cordoba
	5	23 4	21	A	6	535	Lick
	5	23 23	60	A	5	78	Lick
	5	23 23	60	A	3	13	Lick
	5	23 23	60	A	5	66	Lick
	5	23 35	36	A	6	535	Lick
	6	0 0	8	B	6	535	Lick
	6	2 42	36	A	5	81	Diamond Hd.
	6	2 42	36	A	4	25	Diamond Hd.
	6	3 8	7	B	5	81	Diamond Hd.
	6	7 12	35	C	3	24	Dairen
	6	7 12	33	C	4	14	Dairen
	6	7 19	48	C	9	88	Dairen
	6	10 56	26	C	8	86	Kodaikanal
	6	11 6	49	C	6	20	Kodaikanal
	6	11 18	25	C	8	29	Kodaikanal
	6	11 20	19	C	8	86	Kodaikanal
	6	14 36	23	B	4	20	Catania
	6	14 38	28	A	10	344	Catania
	6	14 44	60	B	4	113	Johannesburg
	6	15 29	126	A	6	27	Cape
	6	16 47	30	C	8	30	Teneriffe
	6	19 58	28	C	7	113	Cambridge
	6	19 58	28	C	4	16	Cambridge
	6	20 17	6	C	7	113	Cambridge
	6	20 44	15	A	5	68	Cordoba
	6	20 58	25	A	10	343	Cordoba
	6	21 6	12	C	5	51	Ann Arbor
	6	21 7	39	C	5	47	Yerkes
	6	21 9	37	B	5	128	Yerkes
	6	21 9	37	B	5	78	Yerkes
	6	21 12	21	B	6	94	Washington
	6	21 16	40	A	5	68	Cordoba
	6	21 23	5	A	10	343	Cordoba
	6	21 30	..	A	10	343	Cordoba
	6	21 33	10	C	5	47	Yerkes
	6	21 37	90	A	7	78	Santiago

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
May	6	21 44	3	A	10	343	Cordoba
	6	22 48	35	B	6	87	Tacubaya
	6	23 4	12	B	10	336	Tacubaya
	6	23 48	17	B	6	535	Lick
	6	23 48	17	C	4	16	Lick
	7	2 50	15	A	5	81	Diamond Hd.
	7	2 50	15	A	4	25	Diamond Hd.
	7	7 8	45	A	4	14	Dairen
	7	7 10	49	A	3	24	Dairen
	7	7 14	58	A	9	88	Dairen
	7	12 44	18	A	5	60	Simeis
	7	14 34	23	B	4	20	Catania
	7	14 38	29	B	10	344	Catania
	7	14 52	11	A	4	56	Juvisy
	7	14 56	18	A	18	290	Juvisy
	7	15 2	3	..	10	330	Cape
	7	15 12	2	A	18	290	Juvisy
	7	15 13	6	..	10	330	Cape
	7	15 24	10	..	10	330	Cape
	7	15 59	42	..	10	330	Cape
	7	16 28	25	C	8	30	Teneriffe
	7	16 29	25	C	11	250	Teneriffe
	7	17 9	28	C	8	30	Teneriffe
	7	20 46	15	A	5	68	Cordoba
	7	21 2	25	A	10	343	Cordoba
	7	21 6	38	C	5	78	Santiago
	7	21 8	15	B	6	94	Washington
	7	21 16	40	A	5	68	Cordoba
	7	21 24	5	A	10	343	Cordoba
	7	21 24	20	A	6	115	Arequipa
	7	21 39	10	A	10	343	Cordoba
	7	21 55	45	A	5	78	Santiago
	7	23 20	30	B	6	535	Lick
	7	23 20	30	C	5	78	Lick
	7	23 20	30	C	5	66	Lick
	8	2 28	52	A	5	81	Diamond Hd.
	8	2 30	55	A	4	25	Diamond Hd.
	8	3 0	11	A	5	81	Diamond Hd.
	8	7 17	40	C	4	14	Dairen
	8	7 19	43	C	3	24	Dairen
	8	7 20	46	B	9	88	Dairen
	8	9 6	60	B	6	45	Perth
	8	9 6	60	C	10	343	Perth
	8	13 35	7	C	5	91	Beirut
	8	13 43	8	A	5	350	Helwan

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
May	8	13 52	0.5	A	5	350	Helwan
	8	14 39	32	A	10	344	Catania
	8	14 39	27	C	4	20	Catania
	8	15 26	111	A	6	27	Cape
	8	15 32	25	..	10	330	Cape
	8	16 48	50	C	8	30	Teneriffe
	8	20 37	15	B	5	68	Cordoba
	8	20 51	22	B	5	51	Ann Arbor
	8	21 23	10	C	5	128	Yerkes
	8	21 23	10	C	5	78	Yerkes
	8	21 23	10	C	5	47	Yerkes
	8	21 45	13	B	5	68	Cordoba
	8	21 52	10	A	10	343	Cordoba
	9	2 48	22	A	4	25	Diamond Hd.
	9	2 50	26	A	5	81	Diamond Hd.
	9	7 16	40	C	3	24	Dairen
	9	7 16	40	C	9	88	Dairen
	9	7 16	40	C	4	14	Dairen
	9	13 23	20	A	5	91	Beirut
	9	13 38	10	C	5	91	Beirut
	9	13 50	8	A	5	350	Helwan
	9	13 57	0.5	A	5	350	Helwan
	9	14 28	11	B	4	44	Catania
	9	14 32	31	A	4	113	Johannesburg
	9	14 38	20	B	6	130	Geneva
	9	15 22	44	A	6	84	Madrid
	9	15 30	29	A	10	200	Madrid
	9	16 17	30	C	8	30	Teneriffe
	9	16 55	30	C	8	30	Teneriffe
	9	20 12	20	C	5	106	Ottawa
	9	21 38	5	C	5	63	Des Moines
	9	22 55	15	B	6	535	Lick
	9	23 17	60	A	5	78	Lick
	9	23 17	60	A	5	66	Lick
	9	23 17	60	A	4	16	Lick
	9	23 25	43	A	6	535	Lick
	10	2 38	41	A	5	81	Diamond Hd.
	10	2 38	41	A	4	25	Diamond Hd.
	10	3 2	6	A	5	81	Diamond Hd.
	10	7 7	60	B	4	14	Dairen
	10	7 9	64	B	3	24	Dairen
	10	7 12	70	C	9	88	Dairen
	10	9 38	30	B	10	343	Perth
	10	11 0	20	C	8	86	Kodaikanal
	10	11 12	47	C	6	20	Kodaikanal

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
May	10	11 24	25	C	8	86	Kodaikanal
	10	12 41	14	A	5	60	Simeis
	10	13 42	1	A	5	350	Helwan
	10	13 50	7	A	5	350	Helwan
	10	14 34	30	B	4	113	Johannesburg
	10	14 34	15	B	10	344	Catania
	10	14 34	15	B	4	20	Catania
	10	15 21	46	A	6	84	Madrid
	10	15 30	29	A	10	200	Madrid
	10	15 32	108	A	6	27	Cape
	10	16 19	35	C	8	30	Teneriffe
	10	16 37	71	C	11	250	Teneriffe
	10	16 54	28	C	8	30	Teneriffe
	10	21 34	22	C	5	63	Des Moines
	10	23 17	60	A	5	78	Lick
	10	23 17	60	A	5	66	Lick
	10	23 17	60	A	4	16	Lick
	10	23 17	60	A	3	13	Lick
	10	23 25	41	A	6	535	Lick
	10	23 52	9	A	6	535	Lick
	10	23 58	3	A	6	535	Lick
	11	0 1	1	A	6	535	Lick
	11	0 4	10	B	5	79	Berkeley
	11	11 15	40	B	8	86	Kodaikanal
	11	11 20	50	A	6	20	Kodaikanal
	11	11 25	30	A	8	188	Kodaikanal
	11	11 40	9	B	8	86	Kodaikanal
	11	12 49	10	B	5	60	Simeis
	11	13 0	30	A	5	91	Beirut
	11	13 5	40	B	4	24	Beirut
	11	13 10	50	A	6	43	Beirut
	11	13 26	17	A	5	91	Beirut
	11	13 54	3	B	5	350	Helwan
	11	14 38	13	B	4	20	Catania
	11	14 40	17	B	10	344	Catania
	11	15 24	43	A	6	84	Madrid
	11	15 30	30	A	10	200	Madrid
	11	15 32	45	..	10	330	Cape
	11	15 46	86	A	6	27	Cape
	11	16 13	35	C	8	30	Teneriffe
	11	16 23	35	C	11	250	Teneriffe
	11	16 59	21	C	8	30	Teneriffe
	11	17 1	26	C	11	250	Teneriffe
	11	20 40	5	A	5	68	Cordoba
	11	20 47	10	A	10	343	Cordoba

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
May	11	20 53	10	A	5	68	Cordoba
	11	21 16	30	A	5	68	Cordoba
	11	21 16	5	A	10	343	Cordoba
	11	21 27	46	A	5	78	Santiago
	11	21 38	26	A	10	343	Cordoba
	11	21 40	10	A	5	68	Cordoba
	11	22 56	29	B	6	87	Tacubaya
	11	22 57	18	B	10	330	Tacubaya
	11	23 25	39	A	6	535	Lick
	11	23 25	39	A	5	78	Lick
	11	23 25	39	A	5	66	Lick
	11	23 25	39	A	4	16	Lick
	11	23 25	39	A	3	13	Lick
	11	23 31	30	B	10	330	Tacubaya
	11	23 52	7	A	6	535	Lick
	11	23 57	2	A	6	535	Lick
	11	23 59	0.5	A	6	535	Lick
	12	2 10	22	A	5	81	Diamond Hd.
	12	2 28	59	A	4	25	Diamond Hd.
	12	2 40	37	A	5	81	Diamond Hd.
	12	3 3	6	A	5	81	Diamond Hd.
	12	6 22	24	C	3	25	Tokyo
	12	10 56	16	B	8	86	Kodaikanal
	12	11 12	49	A	6	20	Kodaikanal
	12	11 20	40	A	11	12	Kodaikanal
	12	11 24	27	A	8	86	Kodaikanal
	12	11 24	28	A	8	188	Kodaikanal
	12	14 33	15	C	6	130	Geneva
	12	14 40	9	C	4	20	Catania
	12	14 42	16	B	10	344	Catania
	12	14 52	29	A	4	113	Johannesburg
	12	16 26	35	C	8	30	Teneriffe
	12	16 42	67	C	11	250	Teneriffe
	12	16 59	23	C	8	30	Teneriffe
	12	20 43	30	A	5	68	Cordoba
	12	20 48	10	A	10	343	Cordoba
	12	21 0	10	C	5	51	Ann Arbor
	12	21 17	5	A	10	343	Cordoba
	12	21 19	30	A	5	68	Cordoba
	12	21 28	23	C	5	63	Des Moines
	12	21 37	25	A	10	343	Cordoba
	12	21 43	10	A	5	68	Cordoba
	12	22 47	20	B	6	87	Tacubaya
	12	23 13	16	A	6	535	Lick
	12	23 18	45	B	5	78	Lick

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
May	12	23 18	45	B	5	66	Lick
	12	23 18	45	C	3	13	Lick
	12	23 34	13	A	6	535	Lick
	13	2 31	48	A	4	25	Diamond Hd.
	13	2 35	40	A	5	81	Diamond Hd.
	13	7 11	52	B	3	24	Dairen
	13	7 12	35	B	4	14	Dairen
	13	7 14	57	C	9	88	Dairen
	13	14 55	8	B	4	44	Catania
	13	14 56	11	B	10	344	Catania
	13	15 8	40	A	4	113	Johannesburg
	13	16 35	20	C	8	30	Teneriffe
	13	16 53	55	C	11	250	Teneriffe
	13	17 3	25	C	8	30	Teneriffe
	13	20 44	30	A	5	68	Cordoba
	13	21 6	3	A	10	343	Cordoba
	13	21 10	5	C	5	51	Ann Arbor
	13	21 19	30	A	5	68	Cordoba
	13	21 23	27	B	5	63	Des Moines
	13	21 42	10	A	5	68	Cordoba
	13	21 43	32	A	10	343	Cordoba
	13	23 15	0.25	A	6	535	Lick
	13	23 24	43	A	5	66	Lick
	13	23 24	43	A	5	78	Lick
	13	23 24	43	B	3	13	Lick
	13	23 28	35	A	6	535	Lick
	13	23 52	6	A	6	535	Lick
	13	23 58	1	A	6	535	Lick
	14	0 5	0.5	A	6	535	Lick
	14	0 7	0.2	A	6	5	Lick
	14	11 2	28	A	8	86	Kodaikanal
	14	11 13	52	A	6	20	Kodaikanal
	14	11 15	60	A	11	12	Kodaikanal
	14	11 28	21	A	8	86	Kodaikanal
	14	13 16	25	B	5	91	Beirut
	14	13 46	6	A	5	350	Helwan
	14	16 26	20	B	6	27	Cape
	14	16 35	20	C	8	30	Teneriffe
	14	16 47	43	C	11	250	Teneriffe
	14	16 53	25	C	11	250	Teneriffe
	14	16 58	18	C	8	30	Teneriffe
	14	20 55	8	C	5	51	Ann Arbor
	14	23 4	6	B	6	87	Tacubaya
	14	23 10	19	B	10	336	Tacubaya
	14	23 29	30	A	4	16	Lick

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
May	14	23 29	30	B	3	13	Lick
	14	23 29	30	A	5	78	Lick
	14	23 31	25	A	6	535	Lick
	14	23 52	7	A	6	535	Lick
	14	23 57	2	A	6	535	Lick
	14	23 59	0.25	A	6	535	Lick
	15	2 44	25	A	4	25	Diamond Hd.
	15	2 45	28	A	5	81	Diamond Hd.
	15	3 4	7	B	5	81	Diamond Hd.
	15	11 27	22	A	8	86	Kodaikanal
	15	11 27	22	B	6	20	Kodaikanal
	15	15 14	20	A	4	113	Johannesburg
	15	16 52	23	C	8	30	Teneriffe
	15	20 20	50	C	5	51	Ann Arbor
	15	22 46	98	C	5	78	Lick
	15	22 46	98	C	5	66	Lick
	15	22 46	98	A	4	16	Lick
	15	22 46	98	B	3	13	Lick
	15	23 43	7	B	6	535	Lick
	15	23 50	4	B	6	535	Lick
	15	23 54	1	A	6	535	Lick
	15	23 55	0.33	B	6	535	Lick
	16	3 6	5	C	5	81	Diamond Hd.
	16	11 26	24	A	8	86	Kodaikanal
	16	11 28	37	B	11	12	Kodaikanal
	16	11 36	22	B	8	188	Kodaikanal
	16	15 23	12	B	4	113	Johannesburg
	16	23 3	81	B	3	13	Lick
	16	23 3	81	B	4	16	Lick
	17	6 45	62	B	4	14	Dairen
	17	20 52	35	B	5	13	Urbana
	18	6 55	50	C	4	14	Dairen
	20	5 38	15	..	10	330	Cape
	20	16 17	6	C	6	535	Lick
	20	16 35	22	C	6	535	Lick
	20	16 35	22	C	5	78	Lick
	20	16 49	1	C	6	535	Lick
	20	18 10	4	A	5	81	Diamond Hd.
	21	0 24	30	C	3	24	Dairen
	21	0 24	30	C	4	14	Dairen
	21	0 28	38	C	9	88	Dairen
	21	4 48	21	B	4	113	Johannesburg
	21	4 53	20	B	6	27	Cape
	21	5 46	1	A	5	350	Helwan
	21	7 32	41	B	10	344	Catania

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
May	21	10 42	15	A	5	68	Cordoba
	21	10 51	10	A	10	343	Cordoba
	21	11 4	20	B	5	78	Santiago
	21	16 23	7	C	6	535	Lick
	21	17 1	18	C	6	535	Lick
	21	18 30	40	A	5	81	Diamond Hd.
	21	19 7	30	B	5	81	Diamond Hd.
	21	23 15	55	C	3	8	Tokyo
	21	23 15	55	C	3	25	Tokyo
	21	23 15	55	C	6	120	Tokyo
	22	5 56	1	B	5	350	Helwan
	22	8 47	3	C	4	36	Göttingen
	22	8 58	9	C	4	36	Göttingen
	22	10 20	2	A	5	68	Cordoba
	22	10 29	5	A	5	68	Cordoba
	22	10 44	15	A	5	68	Cordoba
	22	11 39	15	A	10	343	Cordoba
	22	14 25	7	C	5	51	Ann Arbor
	22	16 16	5	A	6	535	Lick
	22	16 20	1	A	6	535	Lick
	22	16 49	50	B	6	535	Lick
	22	16 49	50	B	5	78	Lick
	22	16 49	50	C	5	66	Lick
	22	17 35	20	B	6	535	Lick
	22	17 53	10	A	6	535	Lick
	22	22 50	11	C	3	8	Tokyo
	22	22 50	11	C	3	25	Tokyo
	22	22 50	11	C	6	120	Tokyo
	23	0 27	16	C	4	14	Dairen
	23	0 27	16	C	3	24	Dairen
	23	0 34	31	B	9	88	Dairen
	23	0 47	15	C	3	24	Dairen
	23	0 47	15	C	4	14	Dairen
	23	2 22	32	A	8	86	Kodaikanal
	23	6 28	3	B	5	350	Helwan
	23	8 9	20	B	10	340	Vienna
	23	8 38	10	B	7	40	O'Gyalla
	23	8 40	20	B	10	340	Vienna
	23	8 52	3	A	18	290	Juvisy
	23	8 58	30	C	4	36	Göttingen
	23	9 1	30	C	4	36	Göttingen
	23	9 12	5	C	10	340	Paris
	23	9 23	46	C	6	84	Madrid
	23	9 24	44	B	10	200	Madrid
	23	9 35	30	B	8	122	Fosterdown

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
May	23	9 36	20	C	4	56	Juvisy
	23	9 37	5	B	11	686	Radcliffe
	23	10 34	2	A	5	68	Cordoba
	23	10 37	4	A	10	343	Cordoba
	23	10 43	5	A	5	68	Cordoba
	23	11 2	15	A	5	68	Cordoba
	23	11 14	45	C	5	78	Santiago
	23	11 20	30	A	10	343	Cordoba
	23	11 35	5	A	5	68	Cordoba
	23	12 6	52	C	10	343	Cordoba
	23	12 42	5	A	10	343	Cordoba
	23	13 52	13	A	6	94	Washington
	23	15 10	19	C	5	128	Yerkes
	23	15 10	19	B	5	78	Yerkes
	23	15 10	19	C	5	47	Yerkes
	23	15 36	17	C	5	128	Yerkes
	23	15 36	17	C	5	78	Yerkes
	23	15 36	17	C	5	47	Yerkes
	23	15 44	50	B	6	91	Northfield
	23	15 53	14	C	5	63	Des Moines
	23	16 9	24	C	5	128	Yerkes
	23	16 9	24	C	5	78	Yerkes
	23	16 9	24	C	5	47	Yerkes
	23	16 17	0.5	A	6	535	Lick
	23	16 19	1	A	6	535	Lick
	23	16 26	8	A	6	535	Lick
	23	16 40	18	A	6	535	Lick
	23	17 25	60	A	6	535	Lick
	23	17 25	60	A	5	78	Lick
	23	17 25	60	A	5	66	Lick
	23	17 25	60	A	3	13	Lick
	23	17 25	60	A	4	16	Lick
	23	18 15	0.17	A	6	535	Lick
	23	18 18	2	A	6	535	Lick
	23	18 38	45	A	5	81	Diamond Hd.
	23	19 40	27	C	5	81	Diamond Hd.
	23	23 14	53	C	3	25	Tokyo
	23	23 14	53	C	6	120	Tokyo
	24	2 53	13	B	8	86	Kodaikanal
	24	3 18	31	A	8	86	Kodaikanal
	24	5 19	60	B	6	27	Cape
	24	7 1	27	C	5	60	Simeis
	24	7 54	47	B	10	344	Catania
	24	7 56	20	B	4	44	Catania
	24	8 34	19	B	10	340	Vienna

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	*f/a*	*f* cm	PLACE
May	24	8 54	7	A	18	290	Juvisy
	24	9 14	21	C	4	36	Göttingen
	24	9 27	32	B	4	56	Juvisy
	24	9 27	32	A	18	290	Juvisy
	24	9 43	30	C	6	100	Paris
	24	9 45	22	C	10	340	Paris
	24	10 38	10	A	5	68	Cordoba
	24	10 40	30	A	10	343	Cordoba
	24	10 54	2	A	5	68	Cordoba
	24	11 4	10	A	5	68	Cordoba
	24	11 31	5	A	10	343	Cordoba
	24	11 43	30	A	10	343	Cordoba
	24	12 3	5	A	10	343	Cordoba
	24	13 26	10	B	5	229	Harvard
	24	13 27	10	B	6	126	Harvard
	24	14 24	10	B	5	51	Ann Arbor
	24	14 37	36	B	5	128	Yerkes
	24	14 37	36	A	5	78	Yerkes
	24	14 37	36	A	5	47	Yerkes
	24	14 41	20	B	5	51	Ann Arbor
	24	15 12	25	B	5	51	Ann Arbor
	24	15 21	27	B	5	128	Yerkes
	24	15 21	27	A	5	78	Yerkes
	24	15 21	27	B	5	47	Yerkes
	24	15 32	5	C	5	63	Des Moines
	24	16 25	10	C	5	63	Des Moines
	24	19 55	12	C	5	81	Diamond Hd
	24	22 58	15	A	3	25	Tokyo
	24	22 58	15	C	3	8	Tokyo
	24	23 30	80	C	6	120	Tokyo
	24	23 40	60	C	3	8	Tokyo
	24	23 40	60	B	3	25	Tokyo
	25	0 35	39	C	3	24	Dairen
	25	0 35	39	C	4	14	Dairen
	25	0 46	59	A	9	88	Dairen
	25	1 6	17	C	3	24	Dairen
	25	1 6	17	C	4	14	Dairen
	25	2 24	21	A	8	86	Kodaikanal
	25	2 49	20	B	8	86	Kodaikanal
	25	5 57	10	A	5	350	Helwan
	25	6 18	2	A	5	350	Helwan
	25	7 12	60	C	6	27	Cape
	25	7 44	30	A	5	60	Simeis
	25	7 52	25	B	10	344	Catania
	25	7 52	25	A	4	44	Catania

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
May	25	8 26	56	A	10	343	Rome
	25	8 42	14	B	7	40	O'Gyalla
	25	8 42	10	B	12	200	O'Gyalla
	25	9 29	18	C	10	343	San Fernando
	25	10 10	30	B	11	686	Radcliffe
	25	10 37	18	A	5	68	Cordoba
	25	10 41	34	C	10	343	Cordoba
	25	10 56	8	B	5	68	Cordoba
	25	11 8	5	A	10	343	Cordoba
	25	11 46	30	A	10	343	Cordoba
	25	11 48	5	A	5	68	Cordoba
	25	14 32	25	A	5	51	Ann Arbor
	25	14 50	45	A	5	128	Yerkes
	25	14 50	45	A	5	78	Yerkes
	25	14 50	45	A	5	47	Yerkes
	25	14 58	23	B	5	51	Ann Arbor
	25	15 20	30	B	5	63	Des Moines
	25	15 35	60	A	15	312	Des Moines
	25	15 39	41	A	5	128	Yerkes
	25	15 39	41	A	5	78	Yerkes
	25	15 39	41	B	5	47	Yerkes
	25	15 59	82	B	15	304	Northfield
	25	15 59	82	B	6	91	Northfield
	25	15 59	82	B	5	30	Northfield
	25	16 32	10	A	6	535	Lick
	25	16 55	30	A	6	535	Lick
	25	16 55	30	A	5	78	Lick
	25	16 55	30	A	5	66	Lick
	25	16 55	30	C	3	13	Lick
	25	16 55	30	A	4	16	Lick
	25	17 18	5	A	6	535	Lick
	25	17 50	10	A	6	535	Lick
	25	17 58	2	A	6	535	Lick
	25	18 55	30	B	5	81	Diamond Hd.
	25	19 16	10	C	5	81	Diamond Hd.
	25	23 26	61	A	3	25	Tokyo
	25	23 26	61	B	3	8	Tokyo
	25	23 46	99	A	6	120	Tokyo
	26	0 19	32	B	3	25	Tokyo
	26	0 19	33	B	3	8	Tokyo
	26	1 2	75	A	4	14	Dairen
	26	1 7	84	B	3	24	Dairen
	26	1 12	95	A	9	88	Dairen
	26	5 29	26	..	10	330	Cape
	26	6 8	10	A	5	350	Helwan

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
May	26	6 18	45	A	5	91	Beirut
	26	6 20	40	B	6	43	Beirut
	26	6 37	20	A	7	68	Helwan
	26	7 10	2	A	5	350	Helwan
	26	8 13	86	B	4	20	Catania
	26	8 15	90	B	10	344	Catania
	26	8 24	20	C	12	200	O'Gyalla
	26	8 26	30	B	7	40	O'Gyalla
	26	9 14	40	B	4	36	Göttingen
	26	9 30	60	C	10	343	San Fernando
	26	9 55	30	B	8	122	Fosterdown
	26	10 48	50	A	5	68	Cordoba
	26	11 0	75	A	10	343	Cordoba
	26	11 22	8	A	5	68	Cordoba
	26	12 20	30	A	10	343	Cordoba
	26	12 41	5	A	10	343	Cordoba
	26	12 46	5	A	5	68	Cordoba
	26	13 10	10	B	7	113	Cambridge
	26	13 25	18	A	7	113	Cambridge
	26	13 25	20	A	6	126	Harvard
	26	13 36	29	A	5	229	Harvard
	26	13 47	24	A	6	126	Harvard
	26	14 4	90	A	8	34	Harvard
	26	14 15	30	A	6	126	Harvard
	26	14 16	76	B	7	113	Cambridge
	26	14 17	78	B	4	16	Cambridge
	26	14 19	9	C	5	128	Yerkes
	26	14 57	50	A	5	128	Yerkes
	26	14 57	50	A	5	78	Yerkes
	26	14 57	50	A	5	47	Yerkes
	26	15 12	35	A	5	51	Ann Arbor
	26	15 44	16	B	5	51	Ann Arbor
	26	15 54	62	B	13	344	Minneapolis
	26	16 0	57	A	5	128	Yerkes
	26	16 0	57	A	5	78	Yerkes
	26	16 0	57	A	5	47	Yerkes
	26	16 10	90	B	14	304	Northfield
	26	16 10	90	B	5	30	Northfield
	26	16 10	90	B	6	91	Northfield
	26	16 20	1	A	6	535	Lick
	26	16 25	5	A	6	535	Lick
	26	16 35	10	A	6	535	Lick
	26	17 5	40	A	5	78	Lick
	26	17 26	82	A	6	535	Lick
	26	17 26	82	A	5	66	Lick

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
May	26	17 26	82	C	3	13	Lick
	26	17 26	82	A	4	16	Lick
	26	17 46	41	A	5	78	Lick
	26	18 17	10	A	6	535	Lick
	27	1 30	109	B	3	24	Dairen
	27	1 30	109	A	4	14	Dairen
	27	1 32	115	B	8	88	Dairen
	27	3 31	22	B	8	86	Kodaikana.
	27	4 3	35	B	8	86	Kodaikanal
	27	6 0	2	A	5	350	Helwan
	27	6 11	10	A	5	350	Helwan
	27	6 17	40	B	4	113	Johannesburg
	27	7 19	10	A	5	350	Helwan
	27	7 54	17	C	5	91	Beirut
	27	7 58	3	A	5	350	Helwan
	27	8 5	51	C	10	344	Catania
	27	8 47	16	A	5	60	Simeis
	27	10 24	10	A	10	343	Cordoba
	27	10 36	20	A	5	68	Cordoba
	27	11 10	60	A	10	343	Cordoba
	27	11 28	75	A	5	68	Cordoba
	27	12 9	60	A	5	78	Santiago
	27	12 16	15	A	5	68	Cordoba
	27	12 17	30	A	10	343	Cordoba
	27	14 23	46	A	6	94	Washington
	27	15 0	60	..	4	32	New Haven
	27	15 29	117	A	5	128	Yerkes
	27	15 29	117	A	5	78	Yerkes
	27	15 29	117	A	5	47	Yerkes
	27	15 34	105	A	5	51	Ann Arbor
	27	15 40	40	B	5	30	Northfield
	27	15 45	44	C	5	106	Ottawa
	27	15 45	44	C	4	30	Ottawa
	27	16 0	80	B	14	304	Northfield
	27	16 5	46	B	13	344	Minneapolis
	27	16 26	1	A	6	535	Lick
	27	16 30	5	A	6	535	Lick
	27	16 41	14	A	6	535	Lick
	27	17 19	50	A	5	78	Lick
	27	17 36	70	A	5	79	Berkeley
	27	17 44	100	A	6	535	Lick
	27	17 53	118	A	5	66	Lick
	27	17 53	118	A	3	13	Lick
	27	17 53	118	A	4	16	Lick
	27	18 18	67	A	5	78	Lick

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
May	27	18 46	12	A	6	535	Lick
	28	0 55	34	C	4	14	Dairen
	28	0 55	34	C	3	24	Dairen
	28	6 16	10	A	5	350	Helwan
	28	6 40	70	A	5	91	Beirut
	28	6 56	30	A	7	68	Helwan
	28	7 5	10	A	5	350	Helwan
	28	7 26	2	A	5	350	Helwan
	28	7 35	60	A	5	60	Simeis
	28	7 38	30	B	5	91	Beirut
	28	10 29	20	C	10	340	Paris
	28	10 41	16	A	5	68	Cordoba
	28	10 43	11	A	10	33	Cordoba
	28	11 23	60	A	5	68	Cordoba
	28	11 30	53	C	10	343	Cordoba
	28	14 40	60	B	5	106	Ottawa
	28	14 40	60	B	4	30	Ottawa
	28	15 12	63	B	5	51	Ann Arbor
	28	15 43	35	B	5	30	Northfield
	28	16 2	34	C	5	63	Des Moines
	28	16 33	2	A	6	535	Lick
	28	16 44	16	A	6	535	Lick
	28	17 18	40	A	5	79	Berkeley
	28	17 24	50	A	5	78	Lick
	28	17 44	90	A	6	535	Lick
	28	17 55	30	A	5	79	Berkeley
	28	18 1	124	A	5	66	Lick
	28	18 5	132	A	4	16	Lick
	28	18 26	73	A	5	78	Lick
	28	18 47	33	B	6	535	Lick
	28	19 32	93	A	5	81	Diamond Hd.
	28	19 53	136	A	4	25	Diamond Hd.
	28	20 40	41	A	5	81	Diamond Hd.
	29	0 4	91	A	3	25	Tokyo
	29	0 4	91	B	3	8	Tokyo
	29	0 27	136	C	6	120	Tokyo
	29	1 15	40	B	3	8	Tokyo
	29	1 15	40	B	3	25	Tokyo
	29	2 2	55	C	3	24	Dairen
	29	2 2	55	B	4	14	Dairen
	29	2 2	55	C	9	88	Dairen
	29	4 19	40	B	8	86	Kodaikanal
	29	4 42	16	A	4	113	Johannesburg
	29	6 4	3	A	5	350	Helwan
	29	6 28	15	A	5	350	Helwan

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	*f/a*	*f* cm	PLACE
May	29	6 44	45	A	7	68	Helwan
	29	6 50	95	A	5	91	Beirut
	29	6 50	95	B	6	43	Beirut
	29	8 24	108	B	10	344	Catania
	29	8 31	35	A	10	343	Rome
	29	9 42	35	A	6	84	Madrid
	29	10 18	45	A	6	130	Geneva
	29	11 26	60	A	10	343	Cordoba
	29	11 56	90	B	5	68	Cordoba
	29	13 37	10	C	7	113	Cambridge
	29	13 47	6	B	7	113	Cambridge
	29	13 48	24	A	5	229	Harvard
	29	13 58	51	B	6	126	Harvard
	29	14 2	32	A	8	34	Harvard
	29	14 17	67	C	4	15	Cambridge
	29	14 17	66	B	8	113	Cambridge
	29	15 36	38	B	5	63	Des Moines
	29	15 37	117	A	5	128	Yerkes
	29	15 37	117	B	5	78	Yerkes
	29	16 32	2	A	6	535	Lick
	29	16 44	18	A	6	535	Lick
	29	17 11	35	A	5	79	Berkeley
	29	17 20	50	A	5	78	Lick
	29	17 35	80	A	6	535	Lick
	29	17 51	40	A	5	79	Berkeley
	29	17 58	125	A	5	66	Lick
	29	18 6	142	A	4	16	Lick
	29	18 23	74	A	5	78	Lick
	29	18 38	44	A	6	535	Lick
	29	23 45	90	A	3	25	Tokyo
	29	23 45	90	B	3	8	Tokyo
	30	0 11	142	B	6	120	Tokyo
	30	1 0	45	B	3	25	Tokyo
	30	1 0	45	C	3	8	Tokyo
	30	3 5	70	A	8	86	Kodaikanal
	30	4 10	15	C	8	86	Kodaikanal
	30	5 56	127	B	4	113	Johannesburg
	30	6 4	5	A	5	350	Helwan
	30	6 26	20	A	5	350	Helwan
	30	6 36	40	A	7	68	Helwan
	30	6 43	60	B	5	91	Beirut
	30	7 53	33	A	5	60	Simeis
	30	8 10	23	B	12	200	O'Gyalla
	30	8 10	25	C	7	40	O'Gyalla
	30	8 30	11	C	7	40	O'Gyalla

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	*f/a*	*f* cm	PLACE
May	30	9 25	50	C	6	100	Paris
	30	9 31	32	A	6	84	Madrid
	30	9 39	30	C	4	36	Göttingen
	30	10 18	20	C	10	340	Paris
	30	10 54	12	B	6	84	Madrid
	30	10 54	12	B	10	200	Madrid
	30	11 8	56	A	10	343	Cordoba
	30	11 58	109	A	5	68	Cordoba
	30	12 21	30	A	10	343	Cordoba
	30	12 50	15	A	10	343	Cordoba
	30	13 2	90	A	5	78	Santiago
	30	15 40	40	B	5	63	Des Moines
	30	15 46	122	A	5	128	Yerkes
	30	15 46	122	A	5	78	Yerkes
	30	15 46	122	A	5	47	Yerkes
	30	15 53	50	B	5	30	Northfield
	30	16 18	100	B	14	304	Northfield
	30	16 18	100	B	6	91	Northfield
	30	16 28	55	B	15	312	Des Moines
	30	16 32	2	A	6	535	Lick
	30	**16 42**	**13**	A	6	535	Lick
	30	16 48	50	B	5	30	Northfield
	30	17 16	35	A	5	79	Berkeley
	30	17 18	54	A	5	78	Lick
	30	17 32	82	A	6	535	Lick
	30	17 56	129	A	5	66	Lick
	30	17 58	43	A	5	79	Berkeley
	30	18 3	145	A	4	16	Lick
	30	18 23	74	A	5	78	Lick
	30	18 37	46	A	6	535	Lick
	31	0 2	45	C	3	25	Tokyo
	31	5 42	87	B	4	113	Johannesburg
	31	6 27	20	A	5	350	Helwan
	31	6 31	50	B	5	91	Beirut
	31	6 42	8	A	5	350	Helwan
	31	8 28	105	B	10	344	Catania
	31	8 34	36	B	12	200	O'Gyalla
	31	8 46	62	B	7	40	O'Gyalla
	31	**8 53**	**61**	B	10	340	Vienna
	31	**9 24**	**60**	B	24	130	Geneva
	31	10 12	30	B	11	686	Radcliffe
	31	10 22	29	C	10	340	Paris
	31	10 58	60	A	10	343	Cordoba
	31	11 36	121	A	5	68	Cordoba
	31	11 46	30	A	10	343	Cordoba

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
May	31	12 10	10	A	10	343	Cordoba
	31	12 24	8	A	10	343	Cordoba
	31	12 58	30	A	5	68	Cordoba
	31	14 51	12	B	5	128	Yerkes
	31	14 51	12	C	5	78	Yerkes
	31	14 51	12	C	5	47	Yerkes
	31	15 45	50	B	5	30	Northfield
	31	16 10	100	B	14	304	Northfield
	31	16 36	2	A	6	535	Lick
	31	16 47	13	A	6	535	Lick
	31	17 22	46	A	5	78	Lick
	31	17 37	76	A	6	535	Lick
	31	18 0	122	A	5	66	Lick
	31	18 7	136	A	4	16	Lick
	31	18 23	75	A	5	78	Lick
	31	18 38	45	A	6	535	Lick
June	1	1 54	111	A	4	14	Dairen
	1	1 54	111	A	3	24	Dairen
	1	5 49	76	A	4	113	Johannesburg
	1	6 42	83	B	5	91	Beirut
	1	8 28	85	A	4	44	Catania
	1	10 40	30	A	6	84	Madrid
	1	11 12	78	A	5	68	Cordoba
	1	11 29	120	A	10	343	Cordoba
	1	12 39	15	A	10	343	Cordoba
	1	13 43	24	A	5	229	Harvard
	1	14 13	64	B	4	15	Cambridge
	1	14 14	60	C	7	113	Cambridge
	1	14 18	87	A	6	126	Harvard
	1	15 32	35	B	14	304	Northfield
	1	15 50	137	B	5	47	Yerkes
	1	15 52	58	B	5	63	Des Moines
	1	15 55	125	A	5	128	Yerkes
	1	15 55	125	B	5	78	Yerkes
	1	16 31	2	A	6	535	Lick
	1	16 41	13	B	6	535	Lick
	1	17 15	50	A	5	78	Lick
	1	17 30	80	A	6	535	Lick
	1	17 36	45	A	5	79	Berkeley
	1	17 57	134	A	5	66	Lick
	1	17 57	134	A	4	16	Lick
	1	18 15	6	A	6	535	Lick
	1	18 22	83	A	5	78	Lick
	1	18 42	44	B	6	535	Lick
	1	19 5	54	B	5	81	Diamond Hd.

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
June	1	19 5	54	B	4	25	Diamond Hd.
	2	1 10	50	C	9	88	Dairen
	2	1 10	50	C	4	14	Dairen
	2	1 10	50	C	3	24	Dairen
	2	5 12	63	B	4	113	Johannesburg
	2	6 59	52	A	7	68	Helwan
	2	7 5	140	B	5	91	Beirut
	2	7 10	30	A	5	350	Helwan
	2	7 40	5	A	5	350	Helwan
	2	8 33	84	B	10	344	Catania
	2	9 30	53	C	24	130	Geneva
	2	9 40	7	A	18	290	Juvisy
	2	9 57	41	C	10	340	Paris
	2	10 0	7	B	3	19	Juvisy
	2	10 8	30	B	11	686	Radcliffe
	2	13 47	32	A	5	229	Harvard
	2	14 11	64	B	7	113	Cambridge
	2	14 11	68	B	4	15	Cambridge
	2	14 18	73	A	6	126	Harvard
	2	15 51	60	B	5	30	Northfield
	2	15 51	60	B	14	304	Northfield
	2	15 51	60	B	6	91	Northfield
	2	16 31	2	A	6	535	Lick
	2	16 41	14	A	6	535	Lick
	2	17 15	50	A	5	78	Lick
	2	17 35	90	A	6	535	Lick
	2	17 56	131	A	5	66	Lick
	2	17 58	135	A	4	16	Lick
	2	18 21	80	A	5	78	Lick
	2	18 41	40	A	6	535	Lick
	2	19 40	81	B	5	81	Diamond Hd.
	3	0 34	35	..	4	60	Zô-Sè
	3	5 50	120	B	4	113	Johannesburg
	3	6 14	5	A	5	350	Helwan
	3	6 35	20	A	5	350	Helwan
	3	6 56	60	A	7	68	Helwan
	3	7 25	50	C	5	91	Beirut
	3	8 10	30	A	5	60	Simeis
	3	8 32	96	A	4	44	Catania
	3	8 51	97	A	10	343	Rome
	3	11 43	121	A	5	68	Cordoba
	3	11 47	120	A	10	343	Cordoba
	3	13 1	15	C	10	343	Cordoba
	3	13 2	30	A	5	68	Cordoba
	3	15 16	92	C	5	106	Ottawa

DATE 1910		G. M. T. h	m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
June	3	15	16	92	C	4	30	Ottawa
	3	16	33	3	A	6	535	Lick
	3	16	43	14	A	6	535	Lick
	3	17	17	50	A	5	78	Lick
	3	17	37	90	A	6	535	Lick
	3	17	58	131	A	5	66	Lick
	3	17	58	131	A	4	16	Lick
	3	18	23	80	A	5	78	Lick
	3	18	43	40	A	6	535	Lick
	3	19	35	153	A	5	81	Diamond Hd.
	4	6	35	30	A	5	350	Helwan
	4	7	54	10	A	5	350	Helwan
	4	7	57	28	A	5	60	Simeis
	4	8	22	44	A	4	44	Catania
	4	10	45	16	A	10	343	Cordoba
	4	11	39	120	A	5	68	Cordoba
	4	12	8	120	A	10	343	Cordoba
	4	12	57	30	A	5	68	Cordoba
	4	13	47	24	A	5	229	Harvard
	4	14	10	55	B	4	15	Cambridge
	4	14	11	54	B	7	113	Cambridge
	4	14	19	64	A	6	126	Harvard
	4	15	5	31	C	5	51	Ann Arbor
	4	15	16	88	C	5	106	Ottawa
	4	15	16	88	C	4	30	Ottawa
	4	16	42	7	A	6	535	Lick
	4	16	48	1	A	6	535	Lick
	4	17	25	55	B	5	78	Lick
	4	17	37	100	A	6	535	Lick
	4	17	58	121	A	5	66	Lick
	4	18	2	130	A	4	16	Lick
	4	18	25	65	B	5	78	Lick
	4	18	48	20	A	6	535	Lick
	4	19	32	163	A	5	81	Diamond Hd.
	5	1	43	130	C	9	88	Dairen
	5	1	43	130	A	4	14	Dairen
	5	1	43	130	A	3	24	Dairen
	5	6	24	3	A	5	350	Helwan
	5	6	47	30	A	5	350	Helwan
	5	7	3	130	A	5	91	Beirut
	5	7	21	20	A	5	350	Helwan
	5	7	26	63	A	5	60	Simeis
	5	7	50	10	A	5	350	Helwan
	5	10	56	15	A	10	343	Cordoba
	5	11	44	120	A	5	68	Cordoba

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
June	5	13 4	30	A	5	68	Cordoba
	5	13 6	120	A	10	343	Cordoba
	5	15 19	68	A	5	128	Yerkes
	5	15 19	68	B	5	78	Yerkes
	5	15 19	68	B	5	47	Yerkes
	5	15 20	76	C	5	51	Ann Arbor
	5	16 18	35	B	5	63	Des Moines
	5	16 33	2	A	6	535	Lick
	5	16 42	13	A	6	535	Lick
	5	17 15	50	A	5	78	Lick
	5	17 40	100	A	6	535	Lick
	5	17 55	130	A	5	66	Lick
	5	17 58	135	A	4	16	Lick
	5	18 20	79	A	5	78	Lick
	5	18 46	29	C	6	535	Lick
	5	19 33	146	A	5	81	Diamond Hd.
	5	23 40	19	C	3	8	Tokyo
	5	23 40	19	C	3	25	Tokyo
	5	23 40	19	C	6	120	Tokyo
	6	1 38	130	A	4	14	Dairen
	6	1 38	130	C	9	88	Dairen
	6	1 38	130	B	3	24	Dairen
	6	6 39	30	A	5	350	Helwan
	6	7 19	33	A	5	60	Simeis
	6	10 40	29	A	6	84	Madrid
	6	11 58	120	A	5	68	Cordoba
	6	12 15	120	A	10	343	Cordoba
	6	13 18	31	A	5	68	Cordoba
	6	15 47	120	A	5	128	Yerkes
	6	15 47	120	A	5	78	Yerkes
	6	15 47	120	A	5	47	Yerkes
	6	15 59	35	B	5	63	Des Moines
	6	16 32	3	C	6	535	Lick
	6	16 42	13	B	6	535	Lick
	6	17 15	50	A	6	535	Lick
	6	17 15	50	A	5	78	Lick
	6	17 53	125	A	5	66	Lick
	6	17 53	126	A	4	16	Lick
	6	18 17	74	A	5	78	Lick
	6	18 30	50	A	6	535	Lick
	6	18 31	10	C	5	81	Diamond Hd.
	6	20 4	99	A	5	81	Diamond Hd.
	7	0 2	105	A	3	8	Tokyo
	7	0 2	105	A	3	25	Tokyo
	7	1 28	115	C	9	88	Dairen

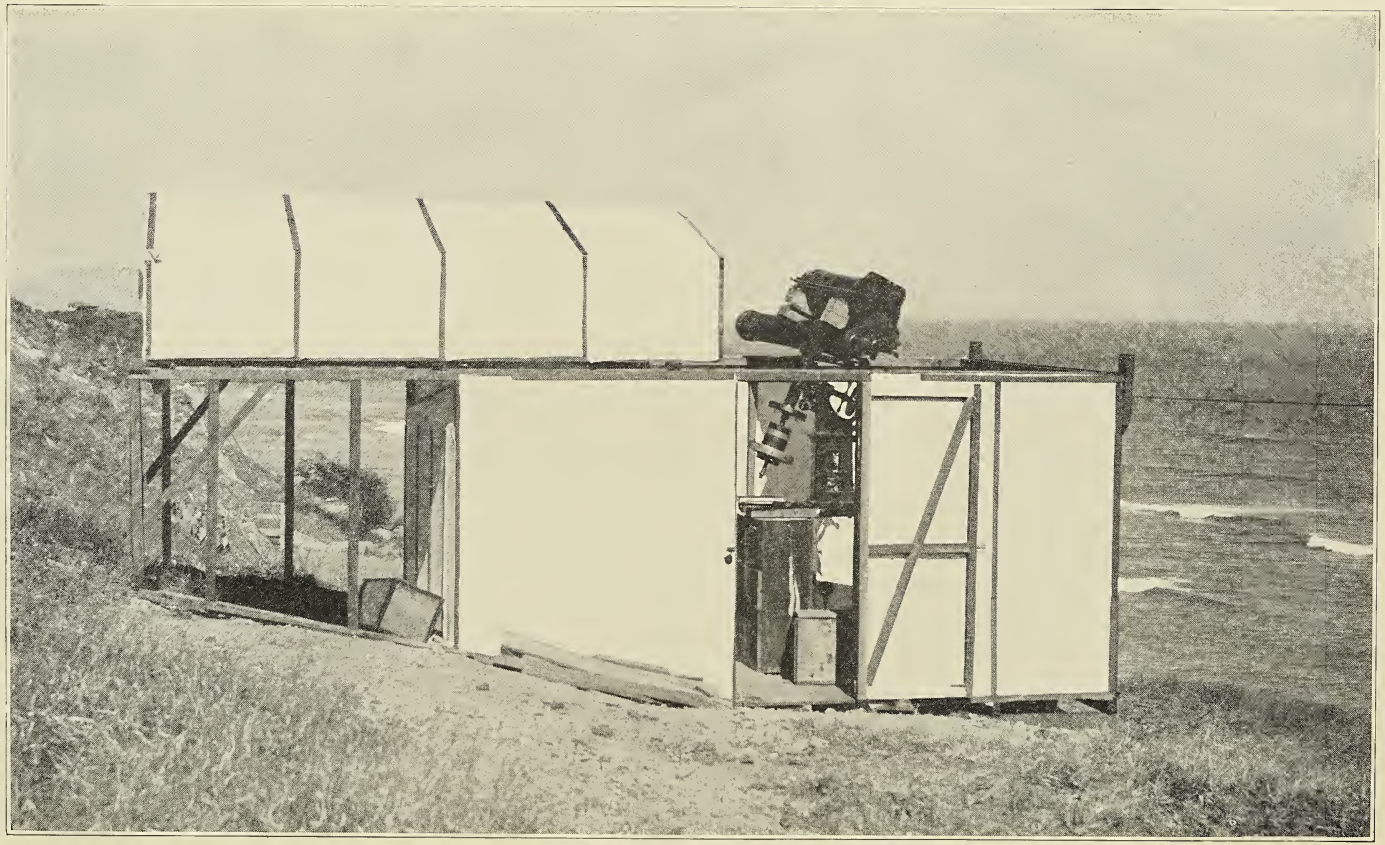
DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	*f/a*	*f* cm	PLACE
June	7	1 28	115	C	3	24	Dairen
	7	1 28	115	C	4	24	Dairen
	7	6 45	30	A	5	350	Helwan
	7	6 58	120	B	5	91	Beirut
	7	6 58	120	B	4	24	Beirut
	7	6 58	120	B	6	43	Beirut
	7	9 55	50	B	10	200	Madrid
	7	9 55	50	A	6	84	Madrid
	7	10 20	45	B	3	19	Juvisy
	7	10 46	50	A	5	68	Cordoba
	7	11 34	15	C	10	343	Cordoba
	7	12 13	120	A	5	68	Cordoba
	7	12 49	120	A	10	343	Cordoba
	7	13 46	30	A	5	68	Cordoba
	7	14 32	47	A	6	94	Washington
	7	15 24	72	A	5	51	Ann Arbor
	7	15 50	115	B	5	128	Yerkes
	7	15 50	115	B	5	78	Yerkes
	7	15 50	115	C	5	47	Yerkes
	7	17 14	54	A	5	78	Lick
	7	17 47	120	A	4	16	Lick
	7	17 47	120	A	5	66	Lick
	7	18 15	65	A	5	78	Lick
	8	1 20	100	C	9	88	Dairen
	8	1 20	100	C	4	14	Dairen
	8	1 20	100	B	3	24	Dairen
	8	6 29	120	..	10	330	Cape
	8	6 40	50	C	5	91	Beirut
	8	6 40	50	C	6	43	Beirut
	8	6 50	15	A	5	350	Helwan
	8	9 48	74	A	6	84	Madrid
	8	9 53	74	A	10	200	Madrid
	8	11 30	120	B	5	68	Cordoba
	8	12 24	120	A	10	343	Cordoba
	8	14 2	35	B	4	15	Cambridge
	8	14 3	34	C	7	113	Cambridge
	8	14 21	60	C	6	126	Harvard
	8	15 17	26	C	5	51	Ann Arbor
	8	16 36	3	A	6	535	Lick
	8	16 46	13	A	6	535	Lick
	8	17 18	49	A	5	78	Lick
	8	17 34	82	B	6	535	Lick
	8	17 53	120	A	5	66	Lick
	8	17 53	120	A	4	16	Lick
	8	18 13	60	A	5	78	Lick

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
June	8	18 35	37	B	6	535	Lick
	9	1 24	102	C	4	14	Dairen
	9	1 24	102	C	9	88	Dairen
	9	1 24	102	C	3	24	Dairen
	9	7 16	30	A	5	350	Helwan
	9	11 59	133	A	5	68	Cordoba
	9	12 14	120	A	10	343	Cordoba
	9	14 50	60	B	6	87	Tacubaya
	9	15 12	36	C	5	51	Ann Arbor
	9	15 43	105	A	5	128	Yerkes
	9	15 43	105	B	5	78	Yerkes
	9	15 43	105	C	5	47	Yerkes
	9	16 42	3	A	6	535	Lick
	9	16 51	10	A	6	535	Lick
	9	17 24	40	A	5	78	Lick
	9	17 40	72	A	6	535	Lick
	9	17 55	102	A	5	66	Lick
	9	17 55	102	A	4	16	Lick
	9	18 16	61	A	5	78	Lick
	9	18 38	16	B	6	535	Lick
	9	19 29	100	A	5	81	Diamond Hd.
	10	1 26	77	C	9	88	Dairen
	10	1 26	77	C	4	14	Dairen
	10	1 26	77	C	3	24	Dairen
	10	6 59	15	B	5	350	Helwan
	10	15 37	105	B	5	128	Yerkes
	10	15 37	105	B	5	78	Yerkes
	10	15 37	105	C	5	47	Yerkes
	10	16 52	7	A	6	535	Lick
	10	17 7	16	B	6	535	Lick
	10	17 7	16	C	5	78	Lick
	10	17 7	16	C	5	66	Lick
	11	1 28	20	C	4	14	Dairen
	11	6 50	25	B	5	350	Helwan
	11	11 26	60	A	5	68	Cordoba
	11	12 12	10	B	5	68	Cordoba
	11	13 30	60	A	5	68	Cordoba
	11	15 26	78	B	5	128	Yerkes
	11	15 26	78	C	5	78	Yerkes
	11	15 26	78	C	5	47	Yerkes
	11	16 52	7	B	6	535	Lick
	11	16 54	10	B	6	535	Lick
	11	17 33	50	B	6	535	Lick
	11	17 33	50	B	6	78	Lick
	11	17 33	50	B	5	66	Lick

DATE 1910		G. M. T. h m	EXPOSURE m	QUALITY	*f/a*	*f* cm	PLACE
June	11	18 7	11	C	6	535	Lick
	11	19 43	113	C	5	81	Diamond Hd.
	12	9 44	47	B	10	200	Madrid
	12	9 44	47	C	6	84	Madrid
	12	11 37	25	A	10	343	Cordoba
	12	15 29	70	C	5	128	Yerkes
	12	15 29	70	C	5	78	Yerkes
	12	16 54	2	A	6	535	Lick
	12	17 1	10	A	6	535	Lick
	12	17 37	60	B	6	535	Lick
	13	9 51	32	A	10	200	Madrid
	13	9 51	32	C	6	84	Madrid
	14	6 32	125	B	6	27	Cape
	14	9 55	30	A	10	200	Madrid
	15	9 45	30	B	10	200	Madrid
	15	9 45	30	B	6	84	Madrid
	15	11 33	25	A	10	343	Cordoba
	16	9 30	31	B	10	200	Madrid
	16	9 30	31	C	6	84	Madrid
	17	9 41	22	B	10	200	Madrid
	17	9 43	26	C	6	84	Madrid
	18	9 56	37	B	10	200	Madrid
	18	9 56	37	C	6	84	Madrid
	19	9 30	31	C	6	84	Madrid
	19	9 30	31	C	10	200	Madrid
	20	9 10	9	C	6	84	Madrid
	21	9 43	26	C	10	200	Madrid
	22	9 26	22	C	10	200	Madrid
	22	9 26	32	C	6	84	Madrid
	23	9 35	38	C	6	84	Madrid
	23	9 35	38	B	10	200	Madrid
	24	9 43	26	B	6	84	Madrid
	24	15 12	20	C	5	51	Ann Arbor
	25	5 42	60	B	4	113	Johannesburg
	25	9 40	31	B	6	84	Madrid
	25	9 40	31	C	10	200	Madrid
	25	15 30	60	C	5	128	Yerkes
	25	15 30	60	C	5	78	Yerkes
	26	17 28	81	B	5	78	Lick
	26	17 28	81	B	5	66	Lick
	27	17 13	5	A	6	535	Lick
	27	17 40	57	B	5	66	Lick
	27	17 43	50	B	6	535	Lick
	28	17 30	60	C	6	535	Lick
	28	17 30	60	B	5	66	Lick

DATE 1910		G. M. T. h	m	EXPOSURE m	QUALITY	f/a	f cm	PLACE
June	28	17	30	60	C	4	16	Lick
July	1	17	27	50	B	6	535	Lick
	1	17	27	50	A	5	66	Lick
	1	17	27	50	A	3	13	Lick
	4	11	31	120	A	5	68	Cordoba
	4	17	21	44	C	6	535	Lick
	4	17	21	44	C	5	66	Lick
	4	17	21	44	C	3	13	Lick
	5	17	21	38	A	6	535	Lick
	5	17	21	38	A	3	13	Lick
	6	11	44	120	A	5	68	Cordoba
	7	17	12	34	B	6	535	Lick
	7	17	12	34	C	3	13	Lick
November	28	0	30	26	C	6	535	Lick
December	13	0	39	86	A	6	535	Lick
	13	0	51	108	C	3	13	Lick
	13	1	40	10	A	6	535	Lick
	14	0	29	20	A	6	535	Lick
	14	0	53	21	A	6	535	Lick
	30	0	35	26	A	6	535	Lick
	30	1	4	26	A	6	535	Lick

PLATE II



Instrument and Observing Shelter at Diamond Head.

PHOTOGRAPHS OF HALLEY'S COMET

Taken at Diamond Head, Hawaii, between April 14 and June 25, 1910

By Ferdinand Ellerman

NOTES ON THE PHOTOGRAPHS

By E. E. Barnard

MEMORANDUM RELATIVE TO STATION IN HAWAII FOR PHOTOGRAPHING HALLEY'S COMET.

BY FERDINAND ELLERMAN.

The site chosen for the photographic telescope was on the south slope of Diamond Head, an extinct crater near the southeast end of the island of Oahu. It is about three-fourths of a mile (1.2 km.) in diameter, with walls rising to a height of seven hundred feet (200 meters) above the ocean, which forms its southern boundary. The co-ordinates are $\phi = +21^\circ\ 15' \pm 10''$, $\lambda = 157^\circ\ 48'\ 30'' \pm 10''$.

The rim of the crater is very narrow, and its slopes are very steep and deeply furrowed by ravines, with narrow ridges between them. In a few places fairly level benches can be found, where buildings might be erected. A splendid macadam road circles the crater, giving access to some of these locations. It was one of these benches, about one hundred and fifty feet (46 meters) above the ocean, and some three hundred feet (92 meters) back from it, that was selected as the location for the shelter and pier for the photographic telescope.

The shelter was constructed of light framing, which was then covered with canvas. The roof rolled back towards the north on casters running in guides, thus leaving the observing room open to the sky. From here a clear view of the horizon was obtained, extending from about thirty (30°) degrees north of east, through the south to about twenty (20°) degrees north of west. Higher amplitudes could be reached with increasing altitudes.

The atmospheric and climatic conditions vary so greatly for different localities on these islands, that it is possible to have exceedingly wet and cloudy weather in one place while at another ten to twelve miles (18 km.) away it may be very dry and free from clouds most of the time. The moist trade winds striking the mountain ranges, which are very precipitous on the windward side, are shot upwards and the moisture is condensed, producing clouds and rain, while towards the south or lee shore the clouds disperse and it may be clear and dry. These are the ordinary conditions of fair weather, and quite different from stormy periods.

In the region of Diamond Head very little rain falls, as the mountains with their clouds lie towards the north and west. It is only during the late autumn and winter, when the warm southern storms come, that this location gets any considerable rain. These conditions were the deciding factors in choosing this site, and it proved to be the best place on the island for observing Halley's Comet. Time and again, during the morning appearance of the comet, photographs were obtained with clear sky, while three or four miles northwest towards Honolulu it would be raining. Clouds interfered a good deal near the horizon, and also occasionally during the exposures. They prevented observations entirely on five mornings between April 25th and May 18th, and on eleven evenings between May 18th and June 11th. The most provoking interruption by clouds was on the morning of the 16th of May, when the sky was clear to within one degree of the comet's head, and the clouds followed the comet as it rose, and broke away only for a few minutes before daylight so that only a short exposure was obtainable.

Another source of considerable annoyance was the strong wind which blows almost constantly at this time of the year, for the Hawaiian Islands lie in the trade wind belt. The wind comes from the northeast and at times blows very strongly. It came in eddies around the ridges of the crater walls so that it was necessary to anchor the shelter, and often during the exposures it was necessary to cap the lens until the telescope steadied again after severe gusts of wind.

The temperature was a redeeming feature, as it ranged from about sixty-eight to eighty-four degrees Fahrenheit, and, with the relatively low humidity most of the time, it gave the most delightful conditions for comfort.

The face of the Sun was carefully observed on May 18 from 14^h0^m to 16^h30^m, G. M. T., with the 6.4 inch visual telescope, for any traces of the comet in transit. While the seeing was not the

best, the granulations of the solar surface were visible. Nothing was seen of the comet or its nucleus. The time of mid-transit, cabled, was 15.8 hours G. M. T. The value given for mid-transit by Professor A. O. Leuschner, in *Astronomical Journal, 26*, 135, is $16^h\ 9^m\ 2^s$ G. M. T., the duration of transit being $58^m\ 50^s$.

NOTES ON THE PHOTOGRAPHS OF HALLEY'S COMET TAKEN AT DIAMOND HEAD BY FERDINAND ELLERMAN.

BY E. E. BARNARD

A brief summary of an inspection by Mr. Barnard of Mr. Ellerman's negatives is given below. The plates were examined and the numerical quantities taken off with dividers and scale.

PHOTOGRAPHS WITH THE 8-INCH BRASHEAR LENS, F = 81 CM.

No. 31, May 7. The tail extends to the edge of the field, or a distance of 10°. It is diffuse and faint toward the end. At 6°.3 from the head its width is 1°.1. Two slender bright lines extend from the head into the tail, to the north and to the south of the axis of the tail. An irregular, diffuse, light streak also extends along the tail south of the axis.

No. 32, May 8. The tail extends to the edge of the field, or a little over 10°.Its width at 7°.2 from the head is 1°.4. There are a considerable number of fine, irregular streaks in the tail. The north side is sharp for about 1° from the head, and concave to the north. This seems to be projected on the diffuse and fainter portion, which is a continuation of the north side of the tail.

No. 33, May 9. The tail extends to the edge of the plate, or a little over 10°. Its width 8° from the head is 1°.8. A broad dark streak extends along the axis for some distance. The tail seems to be made up of a number of slender, irregular streamers, especially towards the south edge, while the north side resembles that of May 8.

No. 34, May 9. The tail extends to the edge of the field, or over 10° in length, but it is very faint in the latter portion. The width is 1°.3 at 7° from the head. The north side of the tail resembles the plates of May 7 and 8. A long dark irregular structure appears in the axis of the tail, but not much structure otherwise.

No. 35, May 11. The tail extends to the edge of the field, or over 10°, but very faint towards the end. A dark streak extends along the axis. The width of the tail is 1°.1 at 7° from the head.

It is broader near the head than in former plates. The entire tail is slightly curved toward the south.

No. 36, May 11. The tail extends to the edge of the field and is slightly convex to the south. A dark streak extends along the axis and seems to be continued by a light streak some 6°.5 from the head. The brighter portion of the tail is concave on the north side for some 4°.5, but the symmetry of the tail is completed by a fainter portion which makes the north edge nearly straight. At 8° from the head the tail is 1°.8 broad.

No. 37, May 11. The head is very bright. The tail is faint and is lost in fogging of plate at a distance of 8°. It is convex on the north side.

No. 38, May 12. The tail extends to the edge of the field and is slightly convex on the south side. Its width 7° from the head is 1°.8. An irregular bright strip from near the head extends along the axis of the tail. Several short streamers appear on the south side. The head is bright in a diffused nebulosity. On the north side of the head is a rather sharply defined outline or portion of an envelope which extends for a short distance only. Beyond this is the regular, but fainter, outline of the head.

No. 39, May 14. This is a very remarkable picture. The tail extends to the edge of the field, and is slightly concave on the south side. It is separated along the axis into two diffuse portions by a light space beginning near the head and extending the full length of the tail. The head is very bright with an eccentric bright region which extends 1° into the tail south of the axis. The tail is very broad to within about 1° of the head where (towards the head) it seems to cease. It gives the appearance of an unfinished outline (to the tail) that would surround the head if complete. At this point it is about 0°.9 in width. At 7° from the head the tail is 1°.8 wide.

No. 40, May 14. The tail is very diffuse and is lost in fogging of the plate. It can be traced as a very wide, diffuse formation for 8°. The nucleus is strongly shown, with the eccentric bright region described in the previous plate. At 3°.6 from the head the width of the tail is 1°.4. There is no structure shown.

No. 42, May 20. There is very little tail. What is shown is very diffuse and broad. It can be traced about 4° from the head. The nucleus is visible with the short, eccentric, bright projection north of the axis of the tail.

No. 43, May 21. The tail, which is very broad, is partly lost in the fogging of the plate. It can be traced for about 8°.5. Its width is 3°.1 at 6°.3 from the head. The nucleus and bright extension

show as in the preceding plate. There is a suggestion of several envelopes about the head.

No. 44, May 21. The tail is very broad, but is soon lost in the fogging of the plate, about 3° from the head, and seems to extend very vaguely beyond that. The nucleus and projection as before.

No. 45, May 23. The tail extends to the edge of the field, or for more than 10°. Its south outline for about 2° is quite sharp. A well-defined narrow dark streak runs from the nucleus along south of the axis of the tail for about 2°. It is convex to the south. The tail is very diffuse and its width 5°.4 from the head is 2°. A broad, irregular streamer brighter than the rest of the tail extends along the axis and is fairly well defined on the south side. This becomes noticeable 2°.7 from the head and bends southward 6°.3 from the head, and then continues in a broader form to the edge of the field. It becomes much more conspicuous as it recedes from the head.

No. 48, May 25. The tail is faint and diffuse, but can be traced for some 9°. An irregular brightness extending along the axis becomes visible 1° from the head, from which point a few bright streamers on each side seem to issue. The head itself is bright and small, and sharply outlined on the south side, and is imbedded in a larger glow.

No. 50, May 28. The tail can be traced to the edge of the field, for about 10°. It is broad and diffuse, with a brighter streamer in the middle, which rapidly widens from a slender point near the head. This seems to be terminated on each side for 4°.5 by a thin, dark outline.

No. 51, May 28. The tail is rather faint and narrow. It can be traced for 8°, but is very diffuse. Along its axis is a similar appearance to that in No. 50. The rest of the width of the tail is lacking, apparently from a want of exposure.

No. 52, June 1. Tail lost in dense fogging of plate 5°.5 from the head. An irregular, bright streamer runs along the axis near the head.

No. 53, June 2. The tail is faint and 5° long, with diverging streamers, which originate 1° from the head.

No. 54, June 3. The head is small and bright and imbedded in diffuse nebulosity. The tail is 7° long and diffuse with two irregular, diverging streamers which begin 2° from the head.

No. 55, June 4. The tail shows for 8°. Its north side is faint and diffuse. The southern portion is brighter and more definite. There is a brighter portion extending along the axis and beginning 3°.5 from the head. Two diverging bright streaks are visible 1° from the head.

No. 56, June 5. The tail is faint and much diffused near the head and 7° long with a brighter region extending along its axis. This is sharply pointed toward the head and widens as it recedes. It begins 0°.4 from the head.

No. 58, June 6. This shows irregular masses receding from the head.

No. 59, June 9. The tail is 5°.5 long and very faint and diffuse except near the head. An irregular, bright streamer extends from the head along the axis of the tail. It divides into two streamers at a distance of 1°.33.

No. 60, June 11. The tail, which is faint and diffuse, can be traced for 3°.5. There is no definite structure.

PHOTOGRAPHS WITH THE BAUSCH AND LOMB TESSAR LENS, F:6.3.

This lens gave very interesting results because of the great width and flatness of its field. The scale is 6°.1 to the inch. The greatest length of the tail shown with this lens, was 50°, on May 14.

Following is a description of the comet as shown on the negatives with the Tessar lens.

No. 1, T, May 4. Three distinct tails are shown. The south one is sharply defined, straight and slender. It is the strongest of the three. It separates into two branches at a distance of 12° from the head. The north tail is less conspicuous and very diffuse. It apparently forms a wide border to the brighter tail from which it slightly diverges. The south tail is very faint and diffuse and makes about the same angle from the central tail. The general appearance is that of a diverging tail with a brighter central portion and the south part very faint. The three tails seem to maintain their independence quite up to the nucleus. The entire length of the tail is 28°.5. It is very faint at the end.

No. 2, T, May 5. The entire length of the tail is 32°, but very faint at the end. At 10° from the head it branches into two streams, the south one being the longer. There are several irregularities on the south edge near the point of branching. The south branch is slightly concave to the south for 19°; it then recurves northward. The north branch, which is 22° long, is very faint and diffuse toward the end. The southern branch is double and its extreme southern part does not seem to connect entirely with the main tail—as if it had severed all connection with the tail proper.

No. 3, T, May 6. The tail, which is very faint towards the end, is 22° long. It gradually widens and there is a slender, threadlike

border to the north edge. This border seems to join a similar one 2°.5 from the head.

No. 4, T, May 7. The tail, which is very faint towards the end, shows for about 27°.5. An irregular, thin, brighter strip begins 6° from the head. It is sinuous and apparently becomes the axis of the tail. From the head to this point the tail is uniform. About 9° from the head the south side of the tail is concave to the south and then becomes irregular. On the south side of the tail is a faint streamer which begins about 6° from the head and seems at its beginning to curve abruptly outward from the tail. Two faint diffuse masses appear near the end of the tail, the first is 17° and the second 20°.5 from the head. Towards its end, the tail has a tendency to curve northwards.

No. 5, T, May 8. The tail is 25° long, uniform and diffuse and slightly diverging. No detail of structure. There seems to be a faint irregular branch on the south side of the tail, beginning 9°.5 from the head.

No. 6, T, May 9. The main tail is 31° long. It diverges slightly and soon becomes very faint and diffuse. Along the axis is a rather narrow diffuse streak, which cannot be traced nearer to the head than 4°. A number of thin faint streamers are visible on the south side of the tail, along with some irregular markings.

No. 7, T, May 11. The tail is 35° long. It widens and is very faint toward the end where its width is about 4°.3. There is little or no structure in it. A narrow, dark streak or line runs along the axis for a distance of about 6°. This apparently continues farther, about the same distance as a bright line.

No. 8, T, May 12. The tail is about 43°.5 long, but very faint for the last 12°. Near its end it is 3°.1 wide. A thin rather irregular and diffuse bright streak runs along the axis of the tail to a distance of 10° or 11°, where it suddenly curves northward for 1° and then forms the northern boundary of the rest of the tail. The portion of the tail south of this line beyond the curve is uniformly denser.

No. 9, T, May 14. The tail is 50° long, but very faint for the last 12°. Near the end it is 4°.3 wide. It is a little darker along the axis for some 9°, but it appears flat and without any structure. The head is very bright, with a bright portion extending into the tail on the south side.

No. 10, T, May 28. The tail is about 34° long. It diffuses from the south side at a distance of 22° from the head. Beginning at the head is a rather diffuse brighter portion which passes to the south

of the axis and later forms the southern boundary of the tail. No other structure.

No. 11, T, June 1. The tail is faint and about 15°.5 long. It is a little brighter on the southern side.

DATE		COMET'S TAIL WITH TESSAR LENS LENGTH	BREADTH	AT DISTANCE
May	4	28°.5	2°.3	18° FROM HEAD
	5	32 .0	4 .0	19
	6	22 .0	2 .6	16
	7	27 .5	3 .1	18
	8	25 .0	3 .1	18
	9	31 .0	3 .7	18
	11	35 .0	4 .3	35
	12	43 .5	3 .1	40
	14	50 .0	4 .3	40
	28	34 .0	6 .6	23
June	1	15 .5	1 .8	12

LIST OF THE FORTY-SEVEN PHOTOGRAPHS OF HALLEY'S COMET BY FERDINAND ELLERMAN REPRODUCED HEREWITH.

ELLERMAN'S NUMBER	DATE 1910	G. M. T. OF MID-EXPOSURE	DURATION OF EXPOSURE	LENS*	PLATE
5	April 26	2^h52^m	35^m	A	III a
7	27	2 32	20	A	III b
12	29	2 34	18	A	III c
15	30	2 48	35	A	III d
17	May 1	2 42	15	A	V a
18	2	2 34	46	A	IV a
19	2	3 2	7	A	V b
20	3	2 12	25	A	IV b
21	3	2 39	24	A	VI
23	4	2 42	40	A	VII
T 1	5	2 45	32	B	V c
25	5	2 46	33	A	VIII
T 2	6	2 42	36	B	V d
27	6	2 42	36	A	IX
28	6	3 8	7	A	X a
T 3	7	2 50	15	B	X b
29	7	2 50	15	A	XI a
30	8	2 58	52	A	XII
T 4	8	2 30	55	B	XI b
31	8	3 0	11	A	XIII

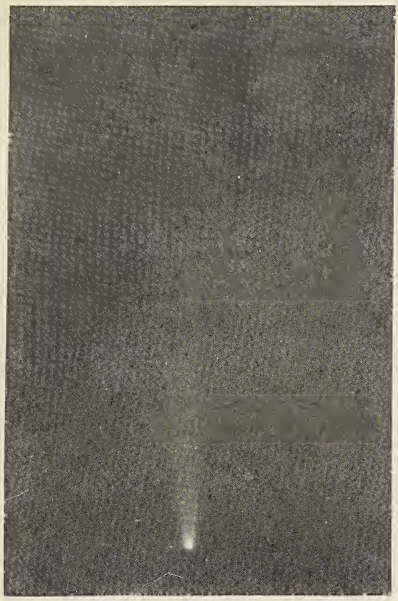
ELLERMAN'S NUMBER	DATE 1910	G. M. T. OF MID-EXPOSURE	DURATION OF EXPOSURE	LENS*	PLATE
T 5	May 9	2^h48^m	22^m	B	X c
32	9	2 50	26	A	XIV
T 6	10	2 38	41	B	X d
33	10	2 38	41	A	XV
34	10	3 2	6	A	XXI a
35	12	2 10	22	A	XVI a
T 7	12	2 28	59	B	XVI b
36	12	2 40	37	A	XVII
T 8**	13	2 31	48	B	XXIII a
38	13	2 35	40	A	XVIII
T 9	15	2 44	25	B	XIX
39	15	2 45	28	A	XX
42	20	18 10	4	A	XXI b
43	21	18 30	40	A	XXI c
45	23	18 38	45	A	XXII
48	25	18 55	30	A	XXIII b
50	28	19 32	93	A	XXIV
T 10	28	19 53	136	B	XXV a
51	28	20 40	41	A	XXV b
52	June 1	19 5	54	A	XXI d
T 11	1	19 5	54	B	XXVI a
53	2	19 40	81	A	XXVI b
54	3	19 34	153	A	XXVII a
55	4	19 32	163	A	XXVII b
56	5	19 33	146	A	XXVI c
58	6	20 4	99	A	XXVIII
59	9	19 29	100	A	XXVI d

* In the column under *Lens,* A denotes the doublet of aperture 6 inches (152 mm) and focal length 31.8 inches (808 mm); B the Tessar lens of aperture 2¼ inches (57 mm) and focal length 9 7/8 inches (251 mm).

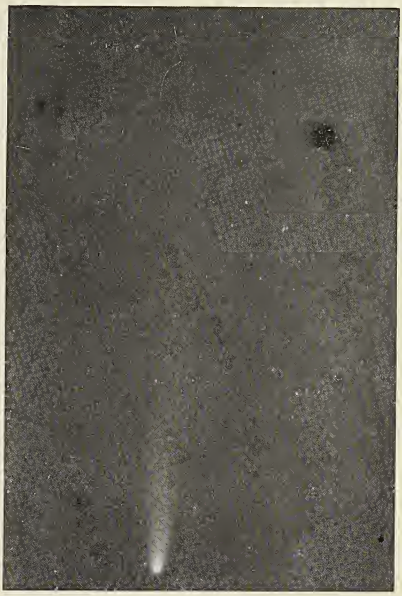
** The irregular luminous areas and spots over much of this plate are defects in the original. There is nothing abnormal about the tail.

Special thanks are due to the Suffolk Engraving and Electrotyping Co., of New York, for their painstaking efforts to have the engravings faithfully represent the original photographs.

PLATE III

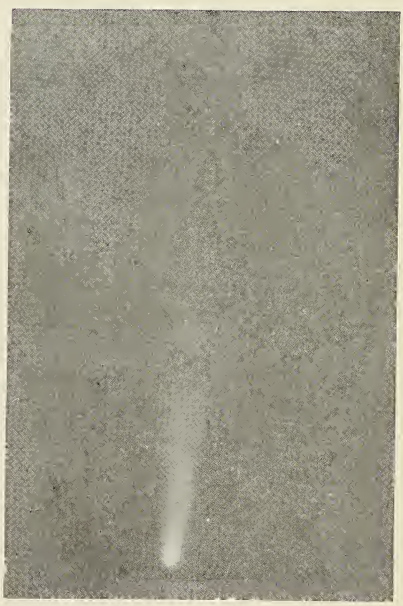


a. No. 5 April $26^{d}\ 2^{h}\ 52^{m}$



b. No. 7. April $27^{d}\ 2^{h}\ 32^{m}$

c. No. 12. April $29^{d}\ 2^{h}\ 34^{m}$



d. No. 15. April $30^{d}\ 2^{h}\ 48^{m}$

PLATE IV

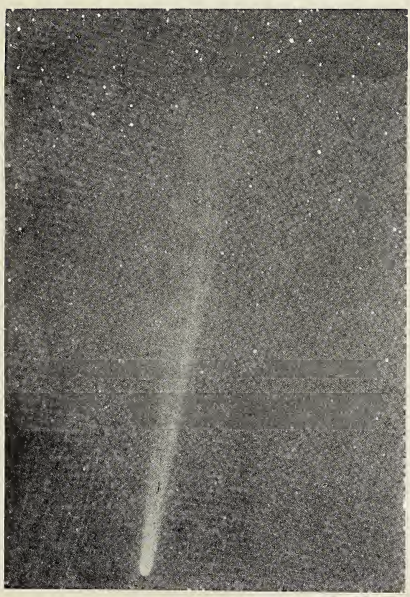
a. No. 18. May $2^{d}\ 2^{h}\ 34^{m}$

b. No. 20. May $3^{d}\ 2^{h}\ 12^{m}$

PLATE V

a. No. 17. May $1^{d}\ 2^{h}\ 42^{m}$

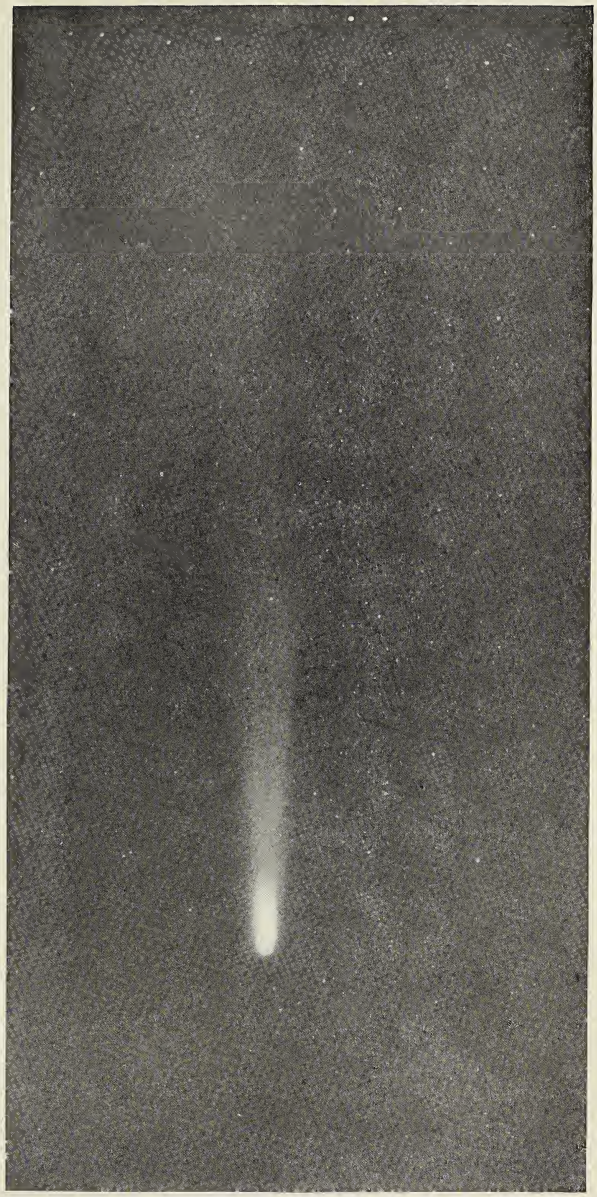
b. No. 19. May $2^{d}\ 3^{h}\ 2^{m}$



c. No. T 1. May $5^{d}\ 2^{h}\ 45^{m}$

d. No. T 2. May $6^{d}\ 2^{h}\ 42^{m}$

PLATE VI



No. 21. May 3^{d} 2^{h} 39^{m}

PLATE VII

No. 23. May 4^{d} 2^{h} 42^{m}

PLATE VIII

No. 25. May 5^{d} 2^{h} 46^{m}

PLATE IX

No. 27. May 6^{d} 2^{h} 42^{m}

PLATE X

a. No. 28. May 6^{d} 3^{h} 8^{m}

b. No. T 3. May 7^{d} 2^{h} 50^{m}

c. No. T 5. May 9^{d} 2^{h} 48^{m}

d. No. T 6. May 10^{d} 2^{h} 38^{m}

PLATE XI

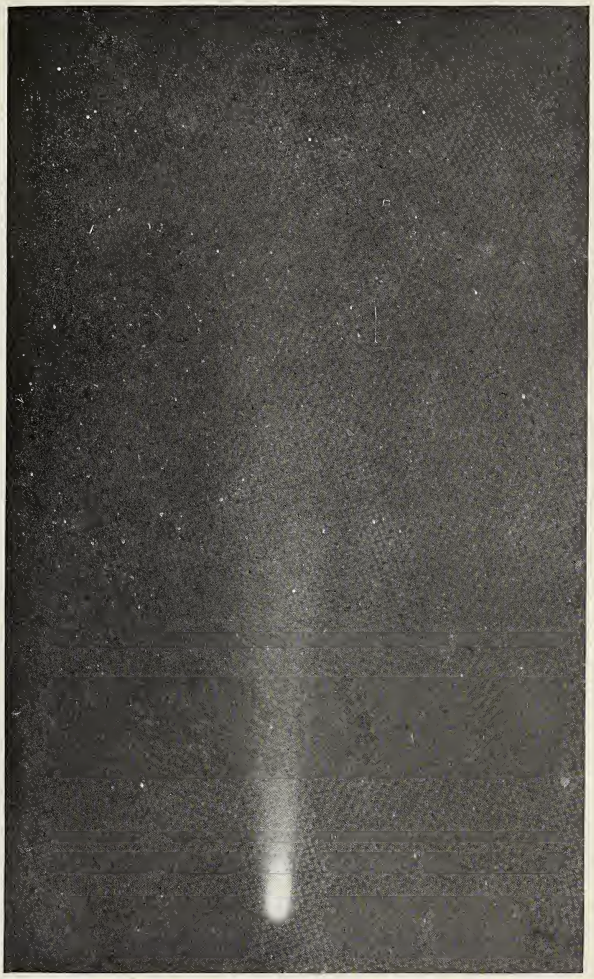
a. No. 29. May 7^{d} 2^{h} 50^{m}

b. No. T 4. May 8^{d} 2^{h} 30^{m}

PLATE XII

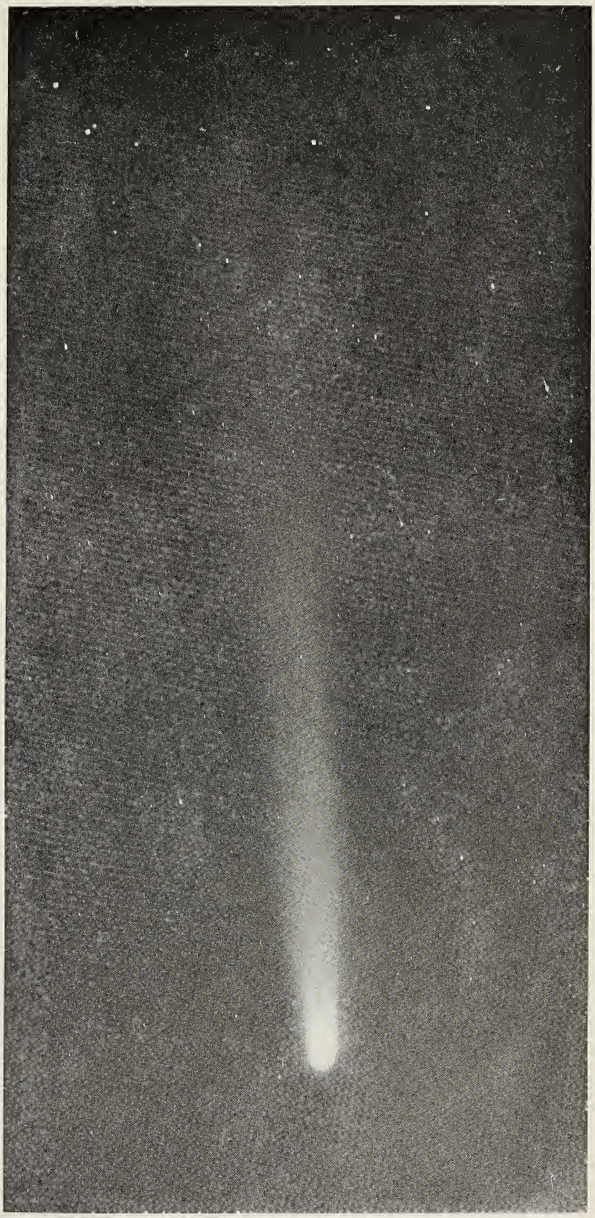
No. 30. May 8^{d} 2^{h} 28^{m}

PLATE XIII



No. 31. May 8^{d} 3^{h} 0^{m}

PLATE XIV



No. 32. May 9^{d} 2^{h} 50^{m}

PLATE XV

No. 33. May 10^{d} 2^{h} 38^{m}

PLATE XVI

a. No. 35. May 12^{d} 2^{h} 10^{m}

b. No. T 7. May 12^{d} 2^{h} 28^{m}

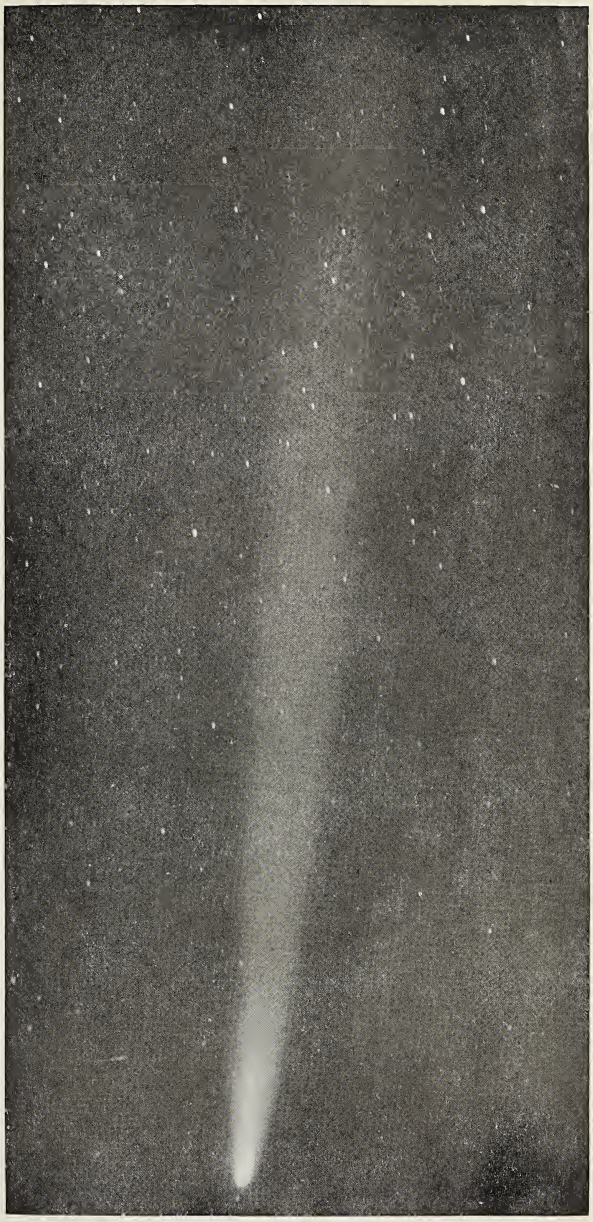
PLATE XVII

No. 36. May 12^{d} 2^{h} 40^{m}

PLATE XVIII

No. 38. May 13^{d} 2^{h} 35^{m}

PLATE XIX



No. T 9. May 15^{d} 2^{h} 44^{m}

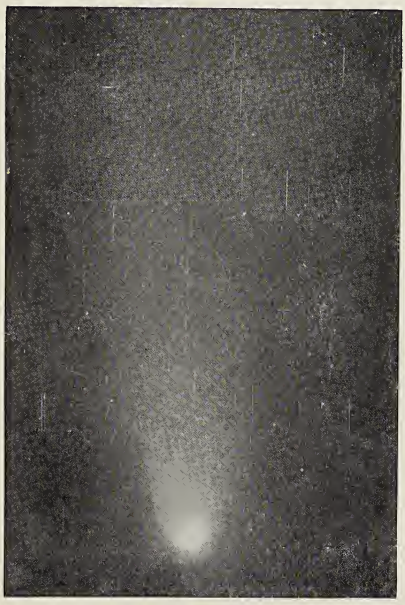
PLATE XX

No. 39. May 15^{d} 2^{h} 45^{m}

PLATE XXI

a. No. 34. May 10^{d} 3^{h} 2^{m}

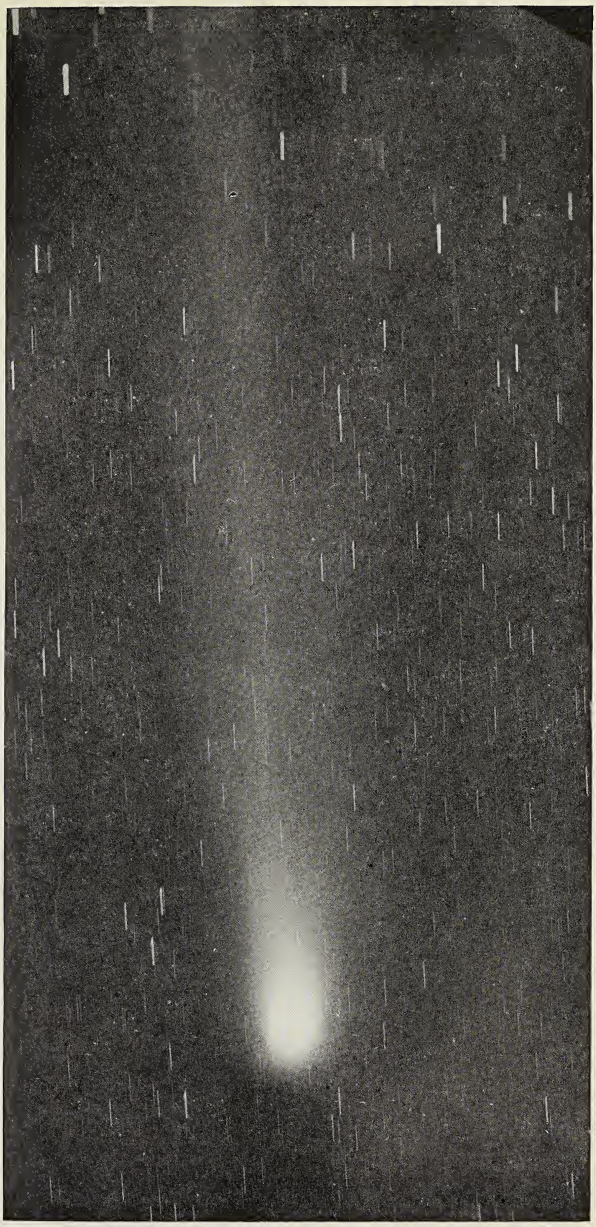
b. No. 42. May 20^{d} 18^{h} 10^{m}



c. No. 43. May 21^{d} 18^{h} 30^{m}

d. No. 52. June 1^{d} 19^{h} 5^{m}

PLATE XXII



No. 45. May 23^{d} 18^{h} 38^{m}

PLATE XXIII

a. No. T 8. May $13^{d}\ 2^{h}\ 31^{m}$

b. No. 48. May $25^{d}\ 18^{h}\ 55^{m}$

PLATE XXIV

No. 50. May 28^{d} 19^{h} 32^{m}

PLATE XXV

a. No. T 10. May 28^{d} 19^{h} 53^{m}

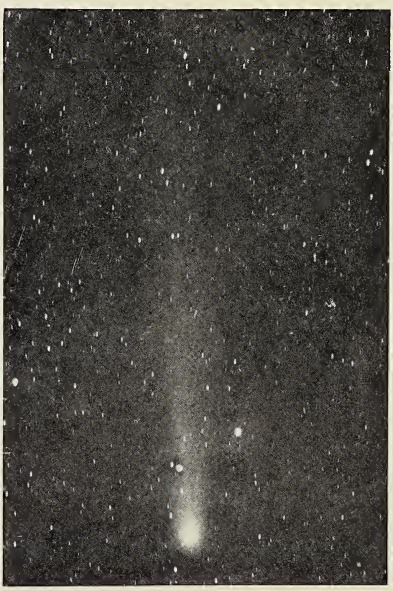
b. No. 51. May 28^{d} 20^{h} 40^{m}

PLATE XXVI

a. No. T 11. June 1^{d} 19^{h} 5^{m}

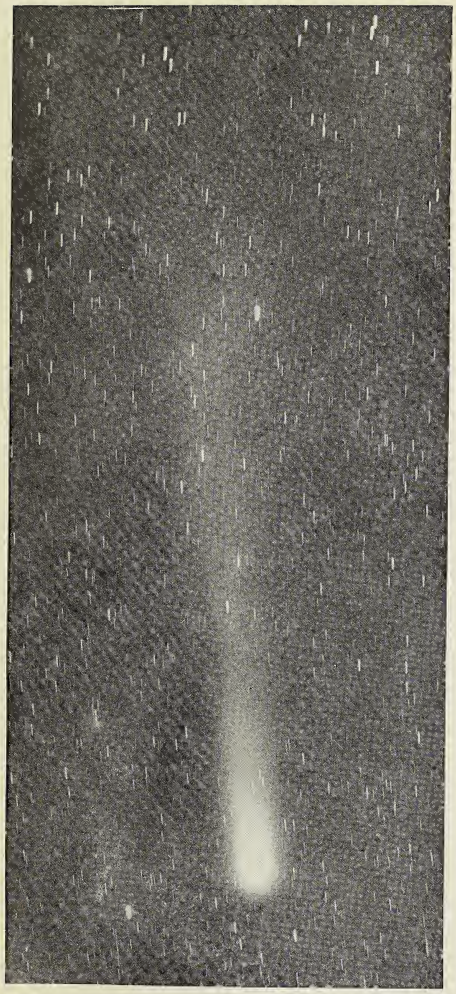
b. No. 53. June 2^{d} 19^{h} 40^{m}

c. No. 56. June 5^{d} 19^{h} 33^{m}

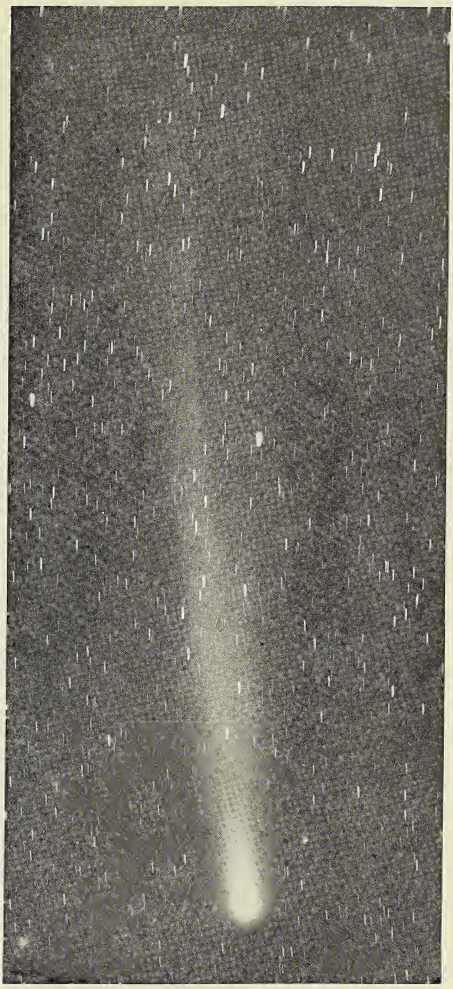


d. No. 59. June 9^{d} 19^{h} 29^{m}

PLATE XXVII



a. No. 54. June 3^{d} 19^{h} 34^{m}



b. No. 55. June 4^{d} 19^{h} 32^{m}

PLATE XXVIII

No. 58. June 6^{d} 20^{h} 4^{m}